MODELING COMPUTATIONAL DYNAMICS OF JOB INTERVIEW CANDIDATE'S MENTAL STATES USING COGNITIVE AGENT BASED APPROACH

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Abstrak

Sokongan untuk temu duga kerja adalah domain yang boleh mendapat manfaat daripada penyelidikan mengenai sistem AI peka-manusia. Model keadaan kognitif yang dibina dapat memberi kesedaran tentang tingkah laku yang ditemuduga sebagai mekanisme untuk proses sokongan pintar. Pembentukan interaksi membina keberkesanan diri, motivasi dan kebimbangan telah dihipotesiskan untuk menentukan keadaan mental seseorang yang ditemuduga. Walau bagaimanapun, pembinaan ini tidak disepadukan, diformalkan dan dinilai untuk kerumitan dinamik mereka dalam kajian terdahulu dan tidak dapat dilaksanakan sebagai komponen penaakulan dalam sistem yang peka-manusia. Kajian ini telah membangunkan model agen kognitif sebagai asas kepada mekanisme cerdas untuk sistem bimbingan temuduga. Model ini menggabungkan tiga konstruk; keberkesanan diri, motivasi dan kerisauan. Setiap konstruk dibentuk sebagai model agen entiti dan kemudiannya disepadukan. Reka bentuk Proses Penyelidikan Sains Reka Bentuk dan Metodologi Pemodelan Berdasarkan Agen telah digunakan untuk menjalankan kajian ini. Interaksi faktor dan hubungan bertindih telah digunapakai untuk mengintegrasi konstruk yang dicadangkan. Model ini diformalkan menggunakan teknik Persamaan Pembezaan Biasa dan kemudiannya disimulasikan. Kes yang dibuktikan telah disahkan dengan analisis kestabilan dan teknik pengesahan logik automatik. Untuk pengesahsahihan model, seramai 36 orang pelajar sarjana dikaji dalam satu percubaan temubual. Keputusan yang diperoleh daripada simulasi model kemudiannya dibandingkan dengan eksperimen manusia. Penilaian adalah berdasarkan teknik statistik iaitu Hotelling T^2. Hasil simulasi telah mengesahkan beberapa pola seperti yang dikenal pasti dalam kesusasteraan domain. Corak tingkah laku setiap model agen serta model bersepadu selaras dengan tingkah laku dinamik calon yang diharapkan dalam situasi temu bual. Keputusan dari pengesahan menunjukkan bahawa tidak terdapat perbezaan yang signifikan (iaitu nilai: ρ kerisauan = 0.391, efikasi diri = 0.128 dan motivasi = 0.466) antara eksperimen simulasi dan manusia. Secara teorinya, dengan adanya tiga konstruk yang dicadangkan, model cadangan dapat mewakili tingkah laku manusia yang lebih baik dalam temu bual. Secara umumnya, dengan memformalkan model tersebut, ia boleh menentukan ciri dinamik secara terperinci. Model kognitif bersepadu ini dapat berfungsi sebagai platform untuk mereka bentuk sistem yang peka-manusia yang memahami keadaan mental pengguna semasa sesi temuduga pekerjaan.

Kata kunci: Pemodelan komputasi, Model berasaskan agen, Keadaan mental calon yang ditemuduga

Abstract

Support for job interview is a domain that can benefit from the research on human-aware AI systems. A developed cognitive model provides the awareness of interviewee behaviours as a mechanism for intelligent support processes. The interplaying constructs of self-efficacy, motivation and anxiety has been hypothesized to define the mental states of an interviewee. However, these constructs have not been integrated, formalized and evaluated for their dynamic intricacies in previous studies hence cannot be implemented as the reasoning component in human-aware system. This study has developed a cognitive agent model as a basic intelligent mechanism for interview coaching systems. The model integrates three constructs; self-efficacy, motivation and anxiety. Each of the constructs is formalized as an entity agent model and then integrated. Design Science Research Processes framework and Agent Based Modelling methodology were used to conduct this study. Factors interaction and overlapping relationship approach was adopted to integrate the proposed constructs. The model is formalized using Ordinary Differential Equation technique and later being simulated. Generated cases were verified with stability analysis and automatic logical verifications techniques. For model validation, 36 undergraduate students were studied in a mock interview experiment. The results generated from the model simulation were then compared against human experiment. The evaluation was based on a statistical technique namely Hotelling's T^2. The simulation results have confirmed a number of patterns identified in the domain literature. The behavioural patterns of the agent models conform to the expected behavioural dynamics of candidate in interview situation. Results from the validation showed that there is no significant difference (i.e. ρ values: anxiety = 0.391, self-efficacy = 0.128 and motivation = 0.466) between the simulation and human experiments. Theoretically, by integration of the three constructs, the model could better represent the mental state of candidates in interviews. In general, by formalizing the model, it can define the dynamic properties in details. The integrated cognitive model serves as a platform for designing a human-aware system that understands the behavioural intricacies of the user during job interview sessions.

Keywords: Computational modelling, Agent-based models, Interviewee mental state, Human-aware system.

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Glossary of Terms

Agent: a discrete entity with its own goals and behaviours, which is autonomous in nature to adapt and modify its behaviours. Each of the construnct is modelled as an entity inform of an agent that can communicate with its environment. The three agent models are unified into an integrated cognitive agent model.

Domain: This is used to refer to the area of coverage or the application of study which is a stretch in human and social psychology, computer science, artificial intelligence and human-aware AI. Domain theories are the related theories in the field of psychology and cognitive science used to define the constructs. Domain model is the identified constituent factors and relationships of the factors for each of the constructs from the domain theories and concepts.

Mental State: a hypothetical state that corresponds to thinking and feeling, and consists of a collection of mental representations and propositional attitudes. This state is represented in the study by the intertwined factors of the constructs of self-efficacy, motivation and anxiety.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Artificial Intelligence (AI) technologies are becoming more robust and reliable hence they are being implemented in different domains to solve complex problems such as in education, transportation, health, stock, and banking (Mohan, Venkatakrishnan, Bobrow, & Pirolli, 2017). The pervasiveness of the AI technologies in our everyday lives is further strengthened by the human-aware component of the intelligence. Several communities in AI – social robotic (Fasola & Matarić, 2013; Fridin, 2014; Guzzi, 2015; Leite, Martinho, & Paiva, 2013; Wainer, Dautenhahn, Robins, & Amirabdollahian, 2014), conversational agents (Hoque, 2015; Rossen & Lok, 2012; Sia, Halan, Lok, & Crary, 2016; Wrobel et al., 2013), and personal assistive systems (Hayes et al., 2015; LeRouge, Dickhut, Lisetti, Sangameswaran, & Malasanos, 2016) have addressed some of the questions that have dominated AI research. These research directions in interactive agent development have been successful through achievements in physical embodiment, verbal and non-verbal behaviour scripting, emotion and gesture understanding in human spaces. However, the aspect of a human-aware AI-modeling and reasoning about human decision making and behaviour is still critical challenges to explore in different application domains (Mohan et al., 2017). In order to be more adaptive and synergistically working with humans, the AI systems must include aspects of intelligence, such as emotional, cognitive or social, to assist humans achieve in a given terrain. Therefore, designing such human-aware systems for the domain of interest involves modeling the mental states of the humans in order to identify their desires and intentions (Bosse, Memon, & Treur, 2011; Narayanan, Zhang,

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APPENDICES

Appendix A

Experiment Participants' Consent Form

Participant Consent Form

My name is **Ajoge Naseer Sanni** and I am a PhD student at Universiti Utara Malaysia (UUM). My research interest is modeling the human mental state in the interview domain for the purpose of injecting digital interview coaching systems with relevant intelligence to understanding the dynamically changing interviewee behaviours.

Please read this consent document carefully before you decide to participate in this study experiment.

Purpose of the research study experiment: The purpose of this experiment is to validate the proposed Integrated Cognitive Agent Model for Interviewees' States Influence. This is to be achieved by measuring some factors which would be used as inputs to the model simulation environment and the output of the simulation would be compared with that of the experiment.

What you will be asked to do in the study experiment: A training session for the experiment would be given. There would be a pre-interview session where participants are administered with self-evaluating questionnaires on input factors. Subsequently, they would be invited to seat for a live interview. Post-interview questionnaires for output factors would then be administered for participants to complete.

Required duration for the interview: 15 minutes.

Date & Time for the experiment: ______________________________________

Venue: Hamman Tukur Computer Centre, Computer Science Department, Kaduna Polytechnic, Kaduna – Nigeria.

Risks: No risk is associated with this experiment.

Benefits / Compensation: There is a monetary compensation of N3000 ($10) for those who completes the experiment process.

Confidentiality: Your identity will be kept confidential to the extent provided by law. The participants' Id is only needed for data coding. When the study is completed and the data have been analysed, the profile lists of the participants will be destroyed. Your profile will not be used in any report.

Voluntary participation: Your participation in this study is voluntary. There is no penalty for not participating.

Right to withdraw from the study: You have the right to withdraw from the study at any time without consequence.

Permission to use your Photos and Videos: The researcher will take photos of the participants and record videos during the experiment. Do you permit the researcher to put your photo in his thesis?

Yes ☐ No ☐

Whom to contact if you have questions about the study experiment: Ajoge Naseer Sanni (School of Computing, Universiti Utara Malaysia) telephone (+60 11-3665 4261 or +234-803-642-4139), and email (ajogenass@yahoo.com); **Supervisors:** Dr. Azizi Ab Aziz, phone (+60 12-403 3654), email (aziziazi@uum.edu.my) and Dr. Shahrul Azmi Bin Mohd. Yusof, phone (+60 13-480 8554), email (shahrulazmi@uum.edu.my)

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Participant **Signature** **Date**

I have read the procedure described above.
I voluntarily agree to participate in the experiment.

Appendix B

Pre-Interview Measuring Instruments

BACKGROUND INFORMATION

i. Id: ____

ii. Program of study ____

iii. Age__________________

iv. Please indicate your gender by marking in the appropriate space

Female ☐ Male ☐

v. Estimate your level of experience in respect to any form of selection interview.

☐ *Extensive experience*

☐ *Substantial experience*

☐ *Moderate experience*

☐ *Limited experience*

☐ *No experience*

Estimate the number of times you have taken selection interview task:

☐ *4 and above times*

☐ *3 times*

☐ *2 times*

☐ *1 times*

☐ *Never*

vi. How many times have you witnessed someone related to you (academic discipline, friend, family) performed successfully in an interview?

☐ *Never*

☐ *1 time*

☐ *2 times*

☐ *3 times*

☐ *4 and above*

Tool 1: **Index of Autonomous Functioning (IAF) scale**

Instructions: Below is a collection of statements about your general experiences. Please indicate how true each statement is of your experiences on the whole. Remember that there are no right or wrong answers. Please answer according to what really reflects your experience rather than what you think your experience should be.

not at all true	a bit true	somewhat true	mostly true	completely true
1	2	3	4	5

Indicate to which extend the following statement about you is true	**1**	**2**	**3**	**4**	**5**
Authorship/self-congruence					
1. My decisions represent my most important values and feelings					
2. I strongly identify with the things that I do					
3. My actions are congruent with who I really am					
4. My whole self stands behind the important decisions I make					
5. My decisions are steadily informed by things I want or care about					
Susceptibility to control					
6. I do things in order to avoid feeling badly about myself					
7. I do a lot of things to avoid feeling ashamed					
8. I try to manipulate myself into doing certain things					
9. I believe certain things so that others will like me					
10.I often pressure myself					
Interest-taking					
11. I often reflect on why I react the way I do.					
12. I am deeply curious when I react with fear or anxiety to events in my life.					
13. I am interested in understanding the reasons for my actions.					
14. I am interested in why I act the way I do.					
15. I like to investigate my feelings					

***Tool 2*: Short Form of Simple Rathus Assertiveness Scale SRAS-SF**

Instruction: One way to gain insight into how assertive you are is to take the following self-report test of assertive behaviour. Read each sentence carefully. Tick on each line whatever number is correct for you.

6 - very much like me
5 - rather like me
4 - somewhat like me
3 - somewhat unlike me
2 - rather unlike me
1 - very unlike me

Tick on each line whatever number is correct for you.	**6**	**5**	**4**	**3**	**2**	**1**
1. Most people stand up for themselves more than I do *						
2. At times I have not made or gone on dates because of my shyness *						
3. When I am eating out and the food I am served is not cooked the way I like it, I complain to the person serving it						
4. If a person serving in a store has gone to a lot of trouble to show me something which I do not really like, I have a hard time saying ―No” *						
5. There are times when I look for a good strong argument						
6. I try as hard to get ahead in life as most people like me do						
7. To be honest, people often get the better of me. *						
8. I do not like making phone calls to businesses or companies. *						
9. I feel silly if I return things I don't like to the store that I bought them from. *						
10. If a close relative that I like was upsetting me, I would hide my feelings rather than say that I was upset. *						
11. I have sometimes not asked questions for fear of sounding stupid. *						
12. During an argument I am sometimes afraid that I will get so upset that I will shake all over. *						
13. If a famous person were talking in a crowd and I thought he or she was wrong, I would get up and say what I thought						
14. If someone has been telling false and bad stories about me, I see him/her as soon as possible to ―have a talk” about it.						
15. I often have a hard time saying ―Nö *						
16. I complain about poor service when I am eating out or in other places						
17. When someone says I have done very well, I sometimes just don't know what to say. *						
18. If a couple near me in the theatre were talking rather loudly, I would ask them to be quiet or to go somewhere else and talk.						
19. I am quick to say what I think.						

Items with asterisk (*) are to be reverse scored.

Tool 3: **Multidimensional Scale of Perceived Social Support**

Instruction: We are interested in how you feel about the following statements regarding the supports you get from family, friends or others. Read each statement carefully and tick appropriate column per question.

1	2	3	4	5	6	7
Very Strongly disagree	Strongly disagree	Mildly disagree	Neutral	Mildly agree	Strongly agree	Very Strongly agree

Indicate how you feel about each statement using the following scale:	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1. There is a special person who is around when I am in need.							
2. There is a special person with whom I can share my joys and sorrows.							
3. My family really tries to help me.							
4. I get the emotional help and support I need from my family.							
5. I have a special person who is a real source of comfort to me.							
6. My friends really try to help me.							
7. I can count on my friends when things go wrong.							
8. I can talk about my problems with my family.							
9. I have friends with whom I can share my joys and sorrows.							
10. There is a special person in my life who cares about my feelings.							
11. My family is willing to help me make decisions.							
12. I can talk about my problems with my friends.							

Tool 4: **Trait Anxiety Scale**

Instructions: A number of statements which people have used to describe themselves are given below. Read each statement and then **tick the appropriate cell of the number to the right of the statement to indicate how you generally feel**. There are no right or wrong answers. Do not spend much time on any one statement but give the answer which seems to describe how you generally feel.

Indicate how you generally feel	Almost Never	Sometimes	Often	Almost Always
	1	2	3	4
1. I feel pleasant				
2. I feel nervous and restless				
3. I am satisfied with myself				
4. I wish I could be as happy as others seems to be				
5. I feel like a failure				
6. I feel rested				
7. I am calm, cool and collected				
8. I feel that difficulties are piling up so that I cannot overcome them				
9. I worry too much over something that doesn't really matter				
10. I am happy				
11. I have disturbing thoughts				
12. I lack self-confidence				
13. I feel secured				
14. I make decision easily				
15. I feel inadequate				
16. I am content				
17. Some unimportant thought rune through my mind and bothers me				
18. I take disappointments so keenly that I can't put them out of my mind				
19. I am a steady person				
20. I get in a state of tension or turmoil as I think my recent concerns and interests.				

Appendix C

Post-Interview Measuring Instruments

Id: ________________

i. Rate the level of demand posed to you by this interview in terms of expected task difficulty, work and time involvement.

- ☐ *Extensively demanding*
- ☐ *Substantial demanding*
- ☐ *Moderate demanding*
- ☐ *Limited demands*
- ☐ *Not demanding*

ii. During the interview, rate the interviewer in terms of persuasion or expression of encouragement to you either before or during the session.

- ☐ *Not at all*
- ☐ *Somewhat*
- ☐ *Moderately*
- ☐ *Very much*

Tool 5: **Perceived Relatedness**

Instruction: Here is a list of statements about what you may feel towards the interviewer or the panel during the interview. Please indicate to what extent you agree with each of the following items.

Do not agree at all	Very Slightly agree	Slightly agree	Moderately agree	Agree	Strongly agree	Very Strongly agree
1	2	3	4	5	6	7

In my relationship with the interviewer during the interview process, I feel ...	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1) ……… supported							
2) ……… close to him/her							
3) ……… understood							
4) ……… attached to him/her.							
5) ……… listened to							
6) ……… bonded to him/her.							
7) ……… valued.							
8) ……… close-knit							
9) ………. safe.							
10)……… as a friend.							

Tool 6: **State Anxiety Sub-scale**

Instruction: A number of statements which people have used to describe themselves are given below. Read each statement and then mark the appropriate number to the right of the statement **to indicate how you feel right during the interview.** There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your feelings best at that moment.

Indicate how you feel right during the interview.	Not at all	Some what	Moderately so	Very much so
	1	2	3	4
1. I feel calm				
2. I feel secure				
3. I am tense				
4. I feel strained				
5. I feel at ease				
6. I feel upset				
7. I am presently worrying over possible misfortune				
8. I feel satisfied				
9. I feel frightened				
10. I feel comfortable				
11. I feel self-confident				
12. I feel nervous				
13. I am jittery				
14. I feel indecisive				
15. I am relaxed				
16. I feel content				
17. I am worried				
18. I am confused				
19. I am steady				
20. I feel pleasant				

Tool 7: **Generalized Self-efficacy scale (GSE)**

Instruction: This scale is a self-report measure of self-efficacy. Indicate how you feel from the items in the table below during the interview. Relate each statement to the interview task.

Items	Not at all true **1**	Hardly true **2**	Moderately true **3**	Exactly true **4**
1. I can always manage to solve difficult problems if I try hard enough				
2. Even when I am opposed during the interview, I can find the means and ways to get my response out. *				
3. It is easy for me to stick to my aims and accomplish my goals.				
4. I am confident that I could deal efficiently with unexpected events.				
5. Thanks to my resourcefulness, I know how to handle all the interview situations. *				
6. I can answer all questions if I invest the necessary effort. *				
7. I can remain calm when facing difficulties because I can rely on my coping abilities.				
8. When I am confronted with difficult questions in the interview, I can usually find several solutions.*				
9. If I am in trouble, I can usually think of a solution				
10. I can usually handle whatever comes my way.				

Tool 7: **Short Form of Questionnaire on Current Motivation**

Instruction: Read each sentence carefully. Tick the appropriate number according to your level of agreement with the senesce. Relate each statement to your thought before or during the last interview and indicate your level of agreement.

1	2	3	4	5	6	7
Very Strongly disagree	Strongly disagree	Mildly disagree	Neutral	Mildly agree	Strongly agree	Very Strongly agree

Items	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1. I think I am up to the difficulty of this interview task							
2. I probably managed to do the interview **							
3. I feel under pressure to do the interview well*							
4. After having understood the instruction, the task seems to be very interesting to me *							
5. I am eager to see how I will perform in the interview *							
6. I am afraid I have made a fool out of myself *							
7. I really tried as hard as I could on the task *							
8. For tasks like this I do not need a reward, they are lots of fun anyhow							
9. It would be embarrassing to fail the interview *							
10. I think everyone could do well on the interview *							
11. If I do well on this task, I would be proud of myself *							
12. I would like to take the interview again even for leisure *							

Appendix D

Coded Data from Instruments

			Raw Data													Converted Data											
SN	ID	SEX	Experience	Experience	vicarious Exp	Autonomy	Assertiveness	social sup	Trait	Task Demand	Persuassion	relatedness	Anxiety	Self-efficacy	Motivation	PE	VX	PA	PN	SS	TR	TD	VP	RD	Lw	Lf	Lm
Total score obtainable			**5**	**4**	**5**	**75**	**114**	**84**	**80**	**5**	**4**	**70**	**80**	**40**	**84**												
1	16/14545	F	2	2	2	46	50	78	39	2	3	40	27	37	68	0.4	0.4	0.6	0.4	0.9	0.5	0.4	0.8	0.6	0.3	0.9	0.8
2	01/14426	M	3	4	3	52	54	57	47	4	3	42	41	32	69	0.8	0.6	0.7	0.5	0.7	0.6	0.8	0.8	0.6	0.5	0.8	0.8
3	16/15010	F	2	3	4	60	63	65	53	2	4	52	42	36	67	0.6	0.8	0.8	0.6	0.8	0.7	0.4	1.0	0.7	0.5	0.9	0.8
4	16/14543	F	1	1	1	57	61	66	32	3	4	47	43	36	60	0.2	0.2	0.8	0.5	0.8	0.4	0.6	1.0	0.7	0.5	0.9	0.7
5	16/14420	M	4	3	3	49	64	66	46	4	3	51	41	32	54	0.8	0.6	0.7	0.6	0.8	0.6	0.8	0.8	0.7	0.5	0.8	0.6
6	16/14343	M	3	3	5	50	49	73	43	3	3	43	44	35	65	0.7	1.0	0.7	0.4	0.9	0.5	0.6	0.8	0.6	0.6	0.9	0.8
7	16/14484	M	2	2	1	54	55	67	46	1	3	48	37	27	61	0.4	0.2	0.7	0.5	0.8	0.6	0.2	0.8	0.7	0.5	0.7	0.7
8	16/14476	F	1	1	2	52	59	61	48	3	4	49	41	35	57	0.2	0.4	0.7	0.5	0.7	0.6	0.6	1.0	0.7	0.5	0.9	0.7
9	16/11287	F	3	4	5	69	69	71	45	3	3	44	27	31	62	0.8	1.0	0.9	0.6	0.8	0.6	0.6	0.8	0.6	0.3	0.8	0.7
10	16/15001	M	2	2	2	27	46	66	46	1	3	55	36	34	54	0.4	0.4	0.4	0.4	0.8	0.6	0.2	0.8	0.8	0.5	0.9	0.6
11	16/14949	M	3	4	5	55	54	68	35	3	4	49	27	31	64	0.8	1.0	0.7	0.5	0.8	0.4	0.6	1.0	0.7	0.3	0.8	0.8
12	16/14441	F	4	4	5	55	50	70	48	2	4	61	36	35	69	0.9	1.0	0.7	0.4	0.8	0.6	0.4	1.0	0.9	0.5	0.9	0.8
13	16/14474	F	3	3	4	72	45	57	41	3	4	54	37	35	54	0.7	0.8	1.0	0.4	0.7	0.5	0.6	1.0	0.8	0.5	0.9	0.6
14	16/14939	F	3	4	3	55	44	57	47	3	2	47	46	29	57	0.8	0.6	0.7	0.4	0.7	0.6	0.6	0.5	0.7	0.6	0.7	0.7
15	16/14550	M	2	1	5	48	55	70	43	3	3	10	27	38	66	0.3	1.0	0.6	0.5	0.8	0.5	0.6	0.8	0.1	0.3	1.0	0.8
16	16/14527	F	1	2	5	54	64	71	50	3	1	46	39	32	46	0.3	1.0	0.7	0.6	0.8	0.6	0.6	0.3	0.7	0.5	0.8	0.5
17	16/14504	M	2	1	1	44	53	65	50	3	4	47	34	34	41	0.3	0.2	0.6	0.5	0.8	0.6	0.6	1.0	0.7	0.4	0.9	0.5
18	16/14352	M	3	3	4	51	52	75	43	3	4	50	33	37	65	0.7	0.8	0.7	0.5	0.9	0.5	0.6	1.0	0.7	0.4	0.9	0.8
19	16/14429	F	4	3	3	53	43	53	49	3	4	59	49	29	65	0.8	0.6	0.7	0.4	0.6	0.6	0.6	1.0	0.8	0.6	0.7	0.8
20	16/14533	F	1	1	2	58	73	70	41	3	3	54	35	32	76	0.2	0.4	0.8	0.6	0.8	0.5	0.6	0.8	0.8	0.4	0.8	0.9
21	16/14940	M	3	3	4	58	41	71	37	4	1	54	32	37	51	0.7	0.8	0.8	0.4	0.8	0.5	0.8	0.3	0.8	0.4	0.9	0.6
22	16/14330	M	1	1	1	56	58	65	52	3	3	52	25	30	60	0.2	0.2	0.7	0.5	0.8	0.7	0.6	0.8	0.7	0.3	0.8	0.7
23	16/14485	M	1	1	2	39	58	51	47	4	4	43	41	32	55	0.2	0.4	0.5	0.5	0.6	0.6	0.8	1.0	0.6	0.5	0.8	0.7
24	16/14529	M	3	1	1	53	49	52	43	1	3	49	42	35	56	0.4	0.2	0.7	0.4	0.6	0.5	0.2	0.8	0.7	0.5	0.9	0.7
25	16/14418	M	3	3	4	55	61	71	44	4	4	54	32	31	51	0.7	0.8	0.7	0.5	0.8	0.6	0.8	1.0	0.8	0.4	0.8	0.6
26	16/14386	M	4	4	3	57	55	66	44	4	3	39	23	24	41	0.9	0.6	0.8	0.5	0.8	0.6	0.8	0.8	0.6	0.3	0.6	0.5
27	16/14397	F	4	4	5	50	52	80	42	4	4	63	34	38	57	0.9	1.0	0.7	0.5	1.0	0.5	0.8	1.0	0.9	0.4	1.0	0.7
28	16/14443	M	3	4	5	47	83	69	44	3	3	54	34	35	49	0.8	1.0	0.6	0.7	0.8	0.6	0.6	0.8	0.8	0.4	0.9	0.6
29	16/14407	M	2	2	1	48	62	54	48	3	3	65	49	32	16	0.4	0.2	0.6	0.5	0.6	0.6	0.6	0.8	0.9	0.6	0.8	0.2
30	16/14998	M	2	3	2	54	72	75	48	3	1	22	36	40	66	0.6	0.4	0.7	0.6	0.9	0.6	0.6	0.3	0.3	0.5	1.0	0.8
31	16/14442	M	3	4	3	50	70	55	43	3	3	33	35	33	53	0.8	0.6	0.7	0.6	0.7	0.5	0.6	0.8	0.5	0.4	0.8	0.6
32	16/14391	M	2	3	3	54	72	70	37	1	1	57	31	29	44	0.6	0.6	0.7	0.6	0.8	0.5	0.2	0.3	0.8	0.4	0.7	0.5
33	16/14399	F	1	1	5	49	62	70	41	3	2	49	25	28	65	0.2	1.0	0.7	0.5	0.8	0.5	0.6	0.5	0.7	0.3	0.7	0.8
34	16/14390	M	5	4	3	66	77	81	43	3	1	31	26	36	69	1.0	0.6	0.9	0.7	1.0	0.5	0.6	0.3	0.4	0.3	0.9	0.8
35	16/14388	M	4	4	4	56	61	54	35	5	1	50	33	32	55	0.9	0.8	0.7	0.5	0.6	0.4	1	0.3	0.7	0.4	0.8	0.7
36	16/14999	F	1	1	1	49	47	62	44	4	3	53	64	17	24	0.2	0.2	0.7	0.4	0.7	0.6	0.8	0.8	0.8	0.8	0.4	0.3

Appendix E

Generated Data from Human Experiment and Simulation

	INPUTS									Human Output			Simulation Output		
sn	PE	VX	PA	PN	SS	TR	TD	VP	RD	Lw	Lf	Lm	Lw	Lf	Lm
1	0.4	0.4	0.6	0.4	0.9	0.5	0.4	0.8	0.6	0.3	0.9	0.8	0.4	0.6	0.8
2	0.8	0.6	0.7	0.5	0.7	0.6	0.8	0.8	0.6	0.5	0.8	0.8	0.5	0.7	0.8
3	0.6	0.8	0.8	0.6	0.8	0.7	0.4	1.0	0.7	0.5	0.9	0.8	0.4	0.6	0.6
4	0.2	0.2	0.8	0.5	0.8	0.4	0.6	1.0	0.7	0.5	0.9	0.7	0.8	0.6	0.5
5	0.8	0.6	0.7	0.6	0.8	0.6	0.8	0.8	0.7	0.5	0.8	0.6	0.4	0.7	0.7
6	0.7	1.0	0.7	0.4	0.9	0.5	0.6	0.8	0.6	0.6	0.9	0.8	0.5	0.8	0.9
7	0.4	0.2	0.7	0.5	0.8	0.6	0.2	0.8	0.7	0.5	0.7	0.7	0.4	0.7	0.8
8	0.2	0.4	0.7	0.5	0.7	0.6	0.6	1.0	0.7	0.5	0.9	0.7	0.3	0.8	0.9
9	0.8	1.0	0.9	0.6	0.8	0.6	0.6	0.8	0.6	0.3	0.8	0.7	0.3	0.7	0.8
10	0.4	0.4	0.4	0.4	0.8	0.6	0.2	0.8	0.8	0.5	0.9	0.6	0.5	0.9	0.7
11	0.8	1.0	0.7	0.5	0.8	0.4	0.6	1.0	0.7	0.3	0.8	0.8	0.4	0.7	0.8
12	0.9	1.0	0.7	0.4	0.8	0.6	0.4	1.0	0.9	0.5	0.9	0.8	0.4	0.8	0.9
13	0.7	0.8	1.0	0.4	0.7	0.5	0.6	1.0	0.8	0.5	0.9	0.6	0.4	0.8	0.7
14	0.8	0.6	0.7	0.4	0.7	0.6	0.6	0.5	0.7	0.6	0.7	0.7	0.5	0.8	0.7
15	0.3	1.0	0.6	0.5	0.8	0.5	0.6	0.8	0.1	0.3	1.0	0.8	0.2	0.8	0.9
16	0.3	1.0	0.7	0.6	0.8	0.6	0.6	0.3	0.7	0.5	0.8	0.5	0.4	0.7	0.8
17	0.3	0.2	0.6	0.5	0.8	0.6	0.6	1.0	0.7	0.4	0.9	0.5	0.4	0.8	0.8
18	0.7	0.8	0.7	0.5	0.9	0.5	0.6	1.0	0.7	0.4	0.9	0.8	0.4	0.8	0.8
19	0.8	0.6	0.7	0.4	0.6	0.6	0.6	1.0	0.8	0.6	0.7	0.8	0.6	0.6	0.5
20	0.2	0.4	0.8	0.6	0.8	0.5	0.6	0.8	0.8	0.4	0.8	0.9	0.5	0.8	0.8
21	0.7	0.8	0.8	0.4	0.8	0.5	0.8	0.3	0.8	0.4	0.9	0.6	0.4	0.8	0.8
22	0.2	0.2	0.7	0.5	0.8	0.7	0.6	0.8	0.7	0.3	0.8	0.7	0.2	0.7	0.7
23	0.2	0.4	0.5	0.5	0.6	0.6	0.8	1.0	0.6	0.5	0.8	0.7	0.5	0.7	0.8
24	0.4	0.2	0.7	0.4	0.6	0.5	0.2	0.8	0.7	0.5	0.9	0.7	0.6	0.5	0.4
25	0.7	0.8	0.7	0.5	0.8	0.6	0.8	1.0	0.8	0.4	0.8	0.6	0.4	0.7	0.7
26	0.9	0.6	0.8	0.5	0.8	0.6	0.8	0.8	0.6	0.3	0.6	0.5	0.3	0.8	0.9
27	0.9	1.0	0.7	0.5	1.0	0.5	0.8	1.0	0.9	0.4	1.0	0.7	0.3	0.8	0.8
28	0.8	1.0	0.6	0.7	0.8	0.6	0.6	0.8	0.8	0.4	0.9	0.6	0.4	0.7	0.7
29	0.4	0.2	0.6	0.5	0.6	0.6	0.6	0.8	0.9	0.6	0.8	0.2	0.7	0.4	0.2
30	0.6	0.4	0.7	0.6	0.9	0.6	0.6	0.3	0.3	0.5	1.0	0.8	0.4	0.8	0.8
31	0.8	0.6	0.7	0.6	0.7	0.5	0.6	0.8	0.5	0.4	0.8	0.6	0.4	0.7	0.8
32	0.6	0.6	0.7	0.6	0.8	0.5	0.2	0.3	0.8	0.4	0.7	0.5	0.4	0.6	0.6
33	0.2	1.0	0.7	0.5	0.8	0.5	0.6	0.5	0.7	0.3	0.7	0.8	0.4	0.7	0.7
34	1.0	0.6	0.9	0.7	1.0	0.5	0.6	0.3	0.4	0.3	0.9	0.8	0.3	0.8	0.8
35	0.9	0.8	0.7	0.5	0.6	0.4	1.0	0.3	0.7	0.4	0.8	0.7	0.3	0.7	0.8
36	0.2	0.2	0.7	0.4	0.7	0.6	0.8	0.8	0.8	0.8	0.4	0.3	0.8	0.4	0.3

Appendix F

Samples Pictures During the Experiment

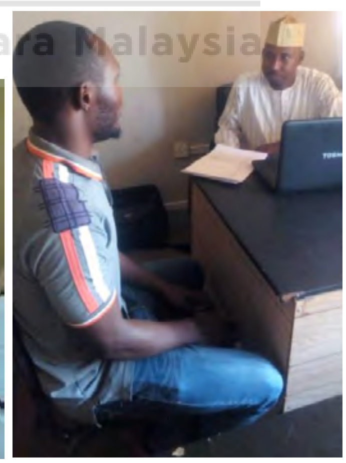
(I) Students during introduction of the experiment (Before Sample Selection)

(II) Pre-interview session

The picture above represents where the experimenter is introducing the instrument to the respondents explaining to them an item at a time while also clearing their doubts and questions.

(III) Group photograph with the respondents after the pre-interview self-assessment survey session

(IV) Interview sessions



(V) Photos with the Interviewers (Lecturers)

Appendix G

Simulation Code for Interviewee Self-Efficacy Agent

```
%clc
%Intializing all parameters to regulate the equations

    maxLimY = 1.2;
    minLimX = 0;
    numStep = 500; % 2 hours of interview (120 mins)

    % parameters of Instantanious factors
    Was = 0.5;     % Weight of Anxiety in Affective State. (1-Was) for Basic Efficacy
    Wep = 0.5;     % Weight of Mastery experience in Experience. (1-Wep) for Vicarious Experience
    alphaEi = 0.5; % For Experience in Efficacy information. (1-alphaEi) for Verbal persuation
    betaBe = 0.5;  % Social support in Basic Efficacy. (1-betaBe) for Mastery Experience
    gammaSk= 0.1;  % For skill. (1-gammaSk) for Long term persistence     CHANGED FROM 0.5

    phiGp = 0.8;   % inner factors for personal goal. (1-phiGp) for progress towards goal CHANGED FROM
0.5
    rhoGp = 0.5;   % Basic efficacy in Personal Goal. (1-rhoGp) for Mastery experience
    Wsp1 = 0.25;    % weight of Basic Efficacy in Short-Term Persistence.
    Wsp2 = 0.25;    % weight of short-term engagement in Short-Term Persistence.
    Wsp3 = 0.25;    % weight of goal in Short-Term Persistence.
    Wsp4 = 0.25;    % weight of long-term efficacy in Short-Term Persistence.
    betaSe = 0.5;  % Internal factors [Be, Sp]of Short-Term engagement. (1-betaSe) for external factors
[Pg,Gf].
    Wse1 = 0.5;    % Basic Efficacy in Short-Term Cognitive engagement. (1-Wse1) for short term
persistence
    Wse2 = 0.5;    % Progress towards goal in Short-Term Cognitive engagement. (1-Wse2) for Generated
effort
    alphaEa = 0.6; % Internal factors [Ei, Gp]of Efficacy appraisal. (1-alphaEa) for external factors [Le,Mf].
    Wea1 = 0.5;    % Efficacy information in Efficacy Appraisal. (1-Wea1) for personal goal
    Wea2 = 0.5;    % Long-term cognitive engagement in Efficacy Appraisal. (1-Wea2) for Mental effort
    gammaMf = 0.5; % External factors [Gp, Gf]of mental Effort. (1-gammaMf) for internal factor [Be].
    psiMf = 0.5;   % Personal goal in Mental Effort. (1-psiMf) for Generated effort.
    Wgf = 0.5;     % Mental effort in Generated effort. (1-Wgf) for short-term efficacy
    Wpg1 = 0.33;    % Short-term efficacy in Progress towards goal
    Wpg2 = 0.33;    % Long-term persistence in Progress towards goal
    Wpg3 = 0.33;    % Mental effort in Progress towards goal
    lamdaSf = 0.7; % Internal factors [Be, Ea, Lp]of Short-term Efficacy. (1-lamdaSf) for external factors
[Gp].
    Wsf1 = 0.33;    % Basic efficacy in short-term efficacy
    Wsf2 = 0.33;    % Efficacy appraisal in short-term efficacy
    Wsf3 = 0.33;    % Long term persistence in short-term efficacy
    Wlp = 0.5;     % sgot termpersistence in long term persistence. (1-wlp) for
    Delta_t = 0.2; % Change in time
    betaLe = 0.5;  % Accumulative Short term Cognitive Engagement
    alphaLp = 0.5; % Accumulative Short term Persistence
    gammaSf = 0.5; % Short term efficacy
    gammaLf = 0.5; % Accumulative Short term Self Efficacy
```

```
%DECLARE ALL VARIABLES AND SET initial VALUES TO EXTERNAL factors
   zz=zeros(4,500);
% External variables
    Ax=zeros(1,numStep); % Anxiety - Arousal interpretation
    Vp=zeros(1,numStep); % Verbal persuasion
    Ve=zeros(1,numStep); % Vicarious experience
    Me=zeros(1,numStep); % Mastery experience
    Ss=zeros(1,numStep); % Social support
    Ps=zeros(1,numStep); % Personality
    Td=zeros(1,numStep); % Task Demand

% Instantanious variables
    As=zeros(1,numStep); % Affective state
    Ep=zeros(1,numStep); % Experience
    Ei=zeros(1,numStep); % Efficacy Information
    Be=zeros(1,numStep); % Basic Efficacy
    Pd=zeros(1,numStep); % Percieved Task Difficulty
    Sk=zeros(1,numStep); % Skill
    Gp=zeros(1,numStep); % Personal Goal
    Sp=zeros(1,numStep); % Short-term persistence
    Se=zeros(1,numStep); % Short-term congitive engagement
    Ea=zeros(1,numStep); % Efficacy appraisal
    Mf=zeros(1,numStep); % Mental Effort
    Gf=zeros(1,numStep); % Generated Effort
    Pg=zeros(1,numStep); % Progress towards Goal

   % cSf=zeros(1,numStep); % combination function for short term efficacy
% Temporal variables
    Lp=zeros(1,numStep); % Long-term Persistence
    Le=zeros(1,numStep); % Long-term cognitive engagement
    Sf=zeros(1,numStep); % Short-term Self Efficacy
    Lf=zeros(1,numStep); % Long-term Self Efficacy

% Initializing temporal Factors

    Lp(1)=0.3;
    Le(1)=0.3;
    %Sf(1)=0.1;
    Lf(1)=0.1;

% initializing external factors
 % creating scenarios
 agent=4;
 flag = true;
while flag
 Scenario=agent;

   for t=1:numStep
      switch (Scenario)
    % A Good sitiation where a less anxious person, have supports (social,
    % vicarious, and verbal), with reasonable levely of positive mastery
```

```
    % experience with average interview difficulty and average skill.
      case(1)
       Ax(t)=0.2;
       Vp(t)=0.7;
       Ve(t)=0.7;
       Me(t)=1;
       Ss(t)=0.8;
       Ps(t)=0.7;
       Td(t)=0.5;
       SKnorm = 0.6;
    %  A completely bad case where an Anxious personality has low Mastery Experience, low social
support, low skill and difficult interview task

      case(2)
       Ax(t)=0.8;
       Vp(t)=0.1;
       Ve(t)=0.1;
       Me(t)=0.5;
       Ss(t)=0.8;
       Ps(t)=0.7;
       Td(t)=0.5;
       SKnorm = 0.6;

    %  Testing the effect of Mastery Experience. A low Mastery experience and low skill with other
favourable conditions produce a
    %  discouraging efficacy and long term cognitive engagement
     case(3)

      Ax(t)=0.2;
       Vp(t)=0.7;
       Ve(t)=0.7;
       Me(t)=0.5;
       Ss(t)=0.1;
       Ps(t)=0.1;
       Td(t)=0.5;
       SKnorm = 0.6;
    %  Testing the absence of Verbal persuation, Vicarious experience, and
    %  high Anxiety state but with high Mastery Experience on final efficacy.
      case(4)
       Ax(t)=0.8;
       Vp(t)=0.1;
       Ve(t)=0.1;
       Me(t)=0.1;
       Ss(t)=0.1;
       Ps(t)=0.1;
       Td(t)=0.5;
       SKnorm = 0.6;

      end

  end

% initialize Internal Factors at time, t=1
```

```
    Be(t) = (betaBe * Ss(t) + (1-betaBe)* Me(t)) * Ps(t);
    As(t) = Ax(t) * (1-Be(t));
    Ep(t) = Wep * Me(t) + (1-Wep)*Ve(t);
    Ei(t) = (alphaEi * Ep(t) + (1-alphaEi) * Vp(t)) * (1 - As(t));

    Sk(t)= gammaSk * SKnorm + (1 - gammaSk) * Lp(t);
    Pd(t)= Td(t) * (1-Sk(t));
    Gp(t)= phiGp * ((rhoGp*Be(t)+(1-rhoGp)*Me(t))*(1-Pd(t)))+(1-phiGp)* Pg(t);
    Sp(t) = Wsp1 * Be(t) + Wsp2*Se(t) + Wsp3*Gp(t) + Wsp4*Lf(t);
    Se(t) = betaSe * (Wse1*Be(t)+(1-Wse1) * Sk(t)) + (1-betaSe) * (Wse2*Pg(t) + (1-Wse2)*Gf(t));
    Ea(t) = alphaEa * (Wea1*Ei(t) + (1-Wea1)*Gp(t)) + (1-alphaEa) * (Wea2*Le(t) + (1-Wea2)*Mf(t));
    Gf(t) = Wgf * Mf(t) + (1-Wgf) * Sf(t);
    Mf(t) = gammaMf * (psiMf*Gp(t) + (1-psiMf)*Gf(t)) + (1-gammaMf)*Be(t);

    Pg(t) = Wpg1 * Sf(t) + Wpg2 * Lp(t) + Wpg3 * Mf(t);
    Sf(t) = lamdaSf * (Wsf1*Gp(t) + Wsf2*Ea(t) + Wsf3*Lp(t)) + (1-lamdaSf)*Be(t);
   % cSf(t) = lamdaSf * (Wsf1*Be(t) + Wsf2*Ea(t)) + (1-lamdaSf)*Gp(t);

    %%%% Re(t)= max((0.5* Ca(1)+0.5*Cp(1))-Me(1),0) ;
    %%%% Rm(1)= Pr(1) * ( 1 - ( GammaRm* Ae(1) + (1-GammaRm) * Cl(1) ));

% Run the Model at time, t=2
for t = 2:numStep

    % Instantaneous Factors
    % Basic Efficacy
    Be(t) = (betaBe * Ss(t) + (1-betaBe)* Me(t)) * Ps(t);
    % Affective state
    As(t) = Ax(t) * (1-Be(t));
    % Experiennce
    Ep(t) = Wep * Me(t) + (1-Wep)*Ve(t);
    % Efficacy information
    Ei(t) = (alphaEi * Ep(t) + (1-alphaEi) * Vp(t)) * (1 - As(t));

    % Skills
    Sk(t)= gammaSk * SKnorm + (1 - gammaSk) * Lp(t-1);
    % Percieved Task Difficulty
    Pd(t)= Td(t) * (1-Sk(t));
    % Personal Goal
    Gp(t)= phiGp * ((rhoGp*Be(t)+(1-rhoGp)*Me(t))*(1-Pd(t)))+(1-phiGp)* Pg(t);
    % Short-Term Persistence
    Sp(t) = Wsp1 * Be(t) + Wsp2*Se(t) + Wsp3*Gp(t) + Wsp4*Lf(t-1);
    % Short-Term Cognitive Engagement
    Se(t) = betaSe * (Wse1*Be(t)+(1-Wse1) * Sk(t)) + (1-betaSe) * (Wse2*Pg(t) + (1-Wse2)*Gf(t));
    % Efficacy Appraisal
    Ea(t) = alphaEa * (Wea1*Ei(t) + (1-Wea1)*Gp(t)) + (1-alphaEa) * (Wea2*Le(t-1) + (1-Wea2)*Mf(t));
     % Generated Effort
    Gf(t) = Wgf * Mf(t) + (1-Wgf) * Sf(t);
    % Mental Effort
    Mf(t) = gammaMf * (psiMf*Gp(t) + (1-psiMf)*Gf(t)) + (1-gammaMf)*Be(t);

    % Progress towards Goal
```

```
    Pg(t) = Wpg1 * Sf(t-1) + Wpg2 * Lp(t) + Wpg3 * Mf(t);
    % Short-Term Self Efficacy
    Sf(t) = lamdaSf * (Wsf1*Gp(t) + Wsf2*Ea(t) + Wsf3*Lp(t-1)) + (1-lamdaSf)*Be(t);

   %%cSf(t) = lamdaSf * (Wsf1*Be(t) + Wsf2*Ea(t)) + (1-lamdaSf)*Gp(t);
    %Temporal Factors

% %      x1(t)= - 1 * (Ml(t)-Me(t));
% %      x2(t)= 1 / ( 1+exp(x1(t)));


    % Accumulative Short-term cognitive engagement
    Le(t)= Le(t-1) + betaLe * (Se(t) - Le(t-1))* Le(t-1) * (1-Le(t-1))* Delta_t;

    % Accumulative Short-term Peristence
    Lp(t) = Lp(t-1) + alphaLp * (Sp(t) - Lp(t-1))* Lp(t-1) * (1-Lp(t-1)) * Delta_t;
    % short-term self efficacy
   % Sf(t)=Sf(t-1)+ gammaSf *(cSf(t) - Sf(t-1))*Sf(t-1)*(1-Sf(t-1))* Delta_t;
    % long term
    Lf(t) = Lf(t-1) + gammaLf * (Sf(t) - Lf(t-1)) * Lf(t-1) * (1-Lf(t-1)) * Delta_t;
    zz(agent,t)=Lf(t-1) + gammaLf * (Sf(t) - Lf(t-1)) * Lf(t-1) * (1-Lf(t-1)) * Delta_t;
end
   if agent == 4;
     flag=false;
   else
   agent=agent+1;
   end
end

% plotting graphs
%x = linspace (300,1,500);
%maxLimY = 1.2;
%    minLimX = 0;
%z=zeros(1,500);
%yy=zeros(2,500);
yy=[Lp;Le];

% z=Le(x);
mesh(zz(1:agent,1:500));
%mesh(yy(1:2,1:500));



%surf(zz(1:4,1:500));
% % hold on;
% % k=Lf(x);
% % mesh(x,y,k);
% % hold on;
% % p=Lp(x);
% % mesh(x,y,p);
% % hold on;
% % b=Be(x);
% % mesh(x,y,b);
```

```
% legend('LT engagement', 'LT Efficacy', 'LT Persistence')
%camlight, lighting phong;
%shading interp;
%t=1:numStep;

%y= plot(t, Be,'m--',t, Le,'m-.',t, Lp,'b--',t, Sf,'k-.',t, Lf,'r--');

 %xlabel('time steps');ylabel('levels');
 %xlim([0 numStep]);ylim([minLimX maxLimY]);
 %hold off;
 %legend(y,'Basic efficacy', 'Cognitive engagement', 'Persistence LT','ST Efficacy', 'LT efficacy');
% %**************************************************************************
% subplot(4,1,3);
% y = plot(t, Sa,'k-.',t, Rp,'r--',t, Ca,'b--');
% xlabel('time steps');ylabel('levels');
% xlim([0 numStep]);ylim([minLimX maxLimY]);
% hold off;
% legend(y,'sa', 'pe','ça');
%
% %**************************************************************************
% subplot(4,1,4);
% y = plot(t, Ae,'k-.',t, Ce,'b--',t,Gd,'r--');
% xlabel('time steps');ylabel('levels');
% xlim([0 numStep]);ylim([minLimX maxLimY]);
% hold off;
% legend(y,'Lc', 'Rd', 'Germane');
```

Appendix H

Simulation Code for Interviewee Motivation Agent

```
%Intializing all parameters to regulate the equations

    maxLimY = 1;
    minLimX = 0;
    numStep = 500; % 2 hours of interview (120 mins)

    % parameters of Instantanious factors
    Wpr = 0.5;     % Weight of interviewer disposition in Percived Relatednessive. (1-Wpr) for personality
    Wpa1 = 0.33;     % Weight of Perceived freedom of action in personal autonomy. (1-Wpa) for
personality
    Wpa2 = 0.33;
    Wpa3 = 0.33;
    alphaPa = 0.9; % Parameter for perceived relatedness and 1-alphaPa) for Affective Valance
    betaPs = 0.5;  % Social support in Perceived support. (1-betaPs) for personality
    gammaSk = 0.5; % Parameter for basic skill and knowledge. (1-alphaSk) for previous experience and
long term persistence
    sigmaSk = 0.5;  % Basic norm (1-betaSk) for knowledge
    Wsk = 0.5;
    pile= 0.5;  % for previous experience in interpretation of experience. (1-gammaIe) for personality and
skill
    Wie = 0.5;     % personality in interpretation of experience. (1-Wie) for skill

    Wpd1 = 0.5;   % interpretation of experinece in task difficulty
    Wpd2 = 0.5;   % Interview skill
    rhoPc = 0.5;   %weight for self-efficacy in Percieved Competence. (1-rhoPc) for Skill and Interpretation
of experience
    Wg1 = 0.4;      % perceived competency in Goal orientation. (1-Wg) for personal autonomy
    Wg2 = 0.4;
    Wg3 = 0.2;
    psiTt = 0.5;   % weight of personal autonomy in task Specific threat. 1-psiTt) for Long term persistence
    alphaEp = 0.5;  % External parameter PC and PS in Performance Experience. (1-alphaEp)for goal
    Wep = 0.5;

    alphaCv=0.2;
    betaCv = 0.5;  % Goal Orientation in Cognitive valence. (1-betaCv) for performance experience
    Wpc1=0.5;
    Wpc2=0.5;
    lamdaVe = 0.5;  % weight of cognitive valence in Expectatncy value. (1-lamdaVe) for affective valence
    lamdaSm=0.5;
    phiSp = 0.5;  % weight of the sum of self-efficacy and short-term motivation. (1-phiSp) for short-term
persistence
    miuMl=0;

    Delta_t = 0.2; % Change in time
    betaLm = 0.5;  % Accumulative Short term Cognitive Engagement
    alphaLp = 0.5; % Accumulative Short term Persistence
    flag=0;
```

```
% -----------------------     ----------------------------------------------------------------------
%DECLARE ALL VARIABLES AND SET initial VALUES TO EXTERNAL factors

% External variables
    Id=zeros(1,numStep); % Interviewer disposition
    Fa=zeros(1,numStep); % Perceived freedom of action
    Ss=zeros(1,numStep); % Social support
    Pn=zeros(1,numStep); % Personality
    Td=zeros(1,numStep); % Task deman
    Pe=zeros(1,numStep); % Previous experience
    Kn=zeros(1,numStep); % Knowledge
    Se=zeros(1,numStep); % Self-efficacy belief

% Instantanious variables
    Pr=zeros(1,numStep); % Perceived relatedness
    Ps=zeros(1,numStep); % Perceived support
    Pd=zeros(1,numStep); % Perceived task difficulty
    Ie=zeros(1,numStep); % Interpretation of experience
    Sk=zeros(1,numStep); % Interview skills
    Pa=zeros(1,numStep); % Perceived personal autonomy
    Go=zeros(1,numStep); % Goal orientation
    Pc=zeros(1,numStep); % Perceived competence
    Sp=zeros(1,numStep); % Short-term persistence
    Tt=zeros(1,numStep); % Task specific threat
    Ep=zeros(1,numStep); % Performance expectancy
    Av=zeros(1,numStep); % Affective valence
    Cv=zeros(1,numStep); % Cognitive valence
    Ve=zeros(1,numStep); % PExpectatncy value
    Sm=zeros(1,numStep); % Short-term motivation

% Temporal variables
    Lm=zeros(1,numStep); % Long-term Motivation
    Lp=zeros(1,numStep); % Long-term Persistence

% Initializing temporal Factors

    Ml(1)=0.1;
    Lp(1)=0.1;

 % initializing external factors
 % creating scenarios
  Scenario=1;
   for t=1:numStep
   switch (Scenario)

      case(1)
        Id(t)=1;
        Fa(t)=1;
        Ss(t)=1;
        Pn(t)=1;
        Td(t)=0.1;
        Pe(t)=0.9;
```

```
        Kn(t)=0.8;
        Se(t)=1;
        SKnorm = 0.9;
    case(2)
        Id(t)=0.9;
        Fa(t)=0.9;
        Ss(t)=0.1;
        Pn(t)=0.2;
        Td(t)=0.8;
        Pe(t)=0.2;
        Kn(t)=0.2;
        Se(t)=0.1;
        SKnorm = 0.2;

    case(3)
        Id(t)=1;
        Fa(t)=1;
        Ss(t)=0.5;
        Pn(t)=0.5;
        Td(t)=0.5;
        Pe(t)=0.5;
        Kn(t)=0.5;
        Se(t)=0.9;
        SKnorm = 0.5;

%    case(4)
%        Ax(t)=0.8;
%        Vp(t)=0.1;
%        Ve(t)=0.1;
%        Me(t)=1;
%        Ss(t)=0.8;
%        Ps(t)=0.8;
%        Td(t)=0.2;
%        SKnorm = 0.8;

   end

   end

% initialize Internal Factors at time, t=1
    t=1;
    Pr(t) = Wpr * Id(t) + (1-Wpr)* Pn(t);
    Pa(t) = alphaPa*(Wpa1*Fa(t) + Wpa2*Pr(t) + Wpa3*Pn(t))+((1-alphaPa)* Av(t));
    Ps(t) = betaPs * Ss(t) + (1-betaPs)* Pn(t);

    Sk(t) = gammaSk * (sigmaSk * SKnorm + (1-sigmaSk)*Kn(t))+(1-gammaSk)*(Wsk*Pe(t)+(1-Wsk)*Lp(t));

    Ie(t) = piIe * Pe(t) + (1-piIe)*(Wie*Pn(t)+(1-Wie)*Sk(t));
    Pd(t) = Td(t)* (1-(Wpd1*Ie(t)+Wpd2*Sk(t)));
    Pc(t) = ((rhoPc*Se(t)+(1-rhoPc)*Sk(t))*Ie(t))*(1-Pd(t));
    Pc(t) = (rhoPc*(Wpc1*Se(t)+ Wpc2*Sk(t))+ (1-rhoPc)*Ie(t))*(1-Pd(t));
    Go(t) = (Wg1*Pc(t) + Wg2*Pa(t) + Wg3*Pd(t))*(1-Tt(t));
```

```
    Tt(t) = Pd(t)* (1 - (psiTt * Pa(t)+(1-psiTt)*Lp(t)));

    %Ep(t) = (alphaEp *(Wep*Pc(t) + (1-Wep)*Ps(t))+(1-alphaEp)*Go(t))*(1-Pd(t));
    Ep(t) = (alphaEp *(Wep*Pc(t) + (1-Wep)*Ps(t))+(1-alphaEp)*(0.5*Go(t)+0.5*Ve(t)))*(1-Pd(t));
    Av(t) = Ep(t)* (1-Tt(t));
    %Cv(t) = betaCv * Go(t) + (1-betaCv) * Ep(t);
    %Cv(t) =(betaCv * Go(t) + (1-betaCv) * Ep(t))+ 0.5*Pd(t);
    Cv(t) = alphaCv*Pd(t) + (1-alphaCv)*(betaCv * Go(t) + (1-betaCv) * Ep(t));
    Ve(t) = lamdaVe * Av(t) + (1-lamdaVe)*Cv(t);
    Sm(t) = lamdaSm*Ve(t) + (1-lamdaSm)*Ep(t);
    Sp(t) = (phiSp * (Se(t) + Sm(t))) * Go(t);

% Run the Model at time, t=2
lamda=0.01;
flag=0;

for t = 2:numStep

    % Instantaneous Factors
    Pr(t) = Wpr * Id(t) + (1-Wpr)* Pn(t);
    Pa(t) = alphaPa*(Wpa1*Fa(t) + Wpa2*Pr(t) + Wpa3*Pn(t))+((1-alphaPa)* Av(t-1));
    Ps(t) = betaPs * Ss(t) + (1-betaPs)* Pn(t);
    Sk(t) = gammaSk * (sigmaSk * SKnorm + (1-sigmaSk)*Kn(t))+(1-gammaSk)*(Wsk*Pe(t)+(1-Wsk)*Lp(t-
1));
    Ie(t) = piIe * Pe(t) + (1-piIe)*(Wie*Pn(t)+(1-Wie)*Sk(t));
    Pd(t) = Td(t)* (1-(Wpd1*Ie(t)+Wpd1*Sk(t)));
    Pc(t) = (rhoPc*(Wpc1*Se(t)+ Wpc2*Sk(t)) + (1-rhoPc)*Ie(t))*(1-Pd(t));
    %Go(t) = ((Wg*Pc(t) + (1-Wg)*Pa(t))*Pd(t))*(1-Tt(t));
    Go(t) = (Wg1*Pc(t) + Wg2*Pa(t) + Wg3*Pd(t))*(1-Tt(t));
    Tt(t) = Pd(t)* (1 - (psiTt * Pa(t)+(1-psiTt)*Lp(t-1)));

    %Ep(t) = (alphaEp *(Pc(t) + Ps(t))+(1-alphaEp)*Go(t))*(1-Pd(t));
    Ep(t) = (alphaEp *(Wep*Pc(t) + (1-Wep)*Ps(t))+(1-alphaEp)*(0.5*Go(t)+0.5*Ve(t-1)))*(1-Pd(t));
   %Ep(t) = (alphaEp *(Wep*Pc(t) + (1-Wep)*Ps(t))+(1-alphaEp)*(Go(t)))*(1-Pd(t));
    Av(t) = Ep(t)* (1-Tt(t));

    Cv(t) = alphaCv*Pd(t) + (1-alphaCv)*(betaCv * Go(t) + (1-betaCv) * Ep(t));
    Ve(t) = (lamdaVe * Av(t) + (1-lamdaVe)*Cv(t));
    Sm(t) = lamdaSm*Ve(t) + (1-lamdaSm)*Ep(t);
    Sp(t) = (phiSp * (Se(t) + Sm(t))) * Go(t);


   % temporal factors

    % Accumulative Short-term motivation

   % Ml(t)= Ml(t-1) + betaMl * ((Ms(t) - Ml(t-1))-lamda)* Ml(t-1) * (1-Ml(t))* Delta_t;
   % Lm?(t+ ?t)=lM(t)+ß_lm.[Pos(Sm(t)-Lm(t)).(1-Lm(t))-Pos(-(Sm(t)-Lm(t)- ?_ml )) .Lm(t)]
    if (Sm(t)-Lm(t)>0)
      Lm(t)=Lm(t-1)+betaLm*(Sm(t)-Lm(t-1))*(1-Lm(t-1))*Delta_t;
    else
      Lm(t)=Lm(t-1)+betaLm*(-(Sm(t)-Lm(t-1)-lamda))*Lm(t-1)*Delta_t;
    end
```

```
    % Accumulative Short-term Peristence
    Lp(t) = Lp(t-1) + alphaLp * (Sp(t)- Lp(t-1))* Lp(t-1) * (1-Lp(t-1)) * Delta_t;
    % z1=Ms(t);
    % z2=Ml(t);
% %      if (flag == 0)
% %
% %         if (Ms(t)-Ml(t)<0.0001)
% %
% %            flag = 1;
% %         end
% %      end
% %      if (flag==1)
% %         lamda=lamda+0.001;
% %      end


end


% plotting graphs
%x = linspace (300,1,500);
hold on
t=1:numStep;
 subplot(2,1,1);
 y=plot(t, Ep,'k-.',t, Ve,'b--');

 xlabel('time steps');ylabel('levels');
 xlim([0 numStep]);ylim([minLimX maxLimY]);
% hold off;
 legend(y,'Performance Expectancy', 'Expectancy Value');
%........................................................................
 subplot(2,1,2);
 y=plot(t, Sm,'k-.',t, Lm,'b--',t, Lp,'r--');
 xlabel('time steps');ylabel('levels');
 xlim([0 numStep]);ylim([minLimX maxLimY]);

 legend(y,'Motivation ST', 'Motivation LT', 'Persistence LT');
 hold off;
%........................................................................
```

Appendix I

Simulation Code for Interviewee Anxiety Agent

```
%Intializing all parameters to regulate the equations

    maxLimY = 1;
    minLimX = 0;
    numStep = 500; % 2 hours of interview (120 mins)

    % parameters of Instantanious factors
    phiSw = 0.7;
    sigmaSw=0.5;
    Wcr1 = 0.25; Wcr2= 0.25; Wcr3=0.25; Wcr4=0.25;
    alphaCr=0.5;
    gammaBw = 0.2;
    alphaSy = 0.5;
    betaBw = 0.5;
    psiSw = 0.5;

    % temporal parameters

    Delta_t = 0.2; % Change in time
    Wzx = 0.5;
    betaAp=0.5;   % Accumulative Short term Persistence
    alphaLw=0.5;  % Accumulative Short term worry

% -----------------------     --------------------------------------------------------------------
% -----------------------     --------------------------------------------------------------------
%DECLARE ALL VARIABLES AND SET initial VALUES TO EXTERNAL factors

% External variables
    Rd=zeros(1,numStep); % Percieved Relatedness to the interviewer
    Td=zeros(1,numStep); % Perceived task difficulty
    Se=zeros(1,numStep); % Self-efficacy
    Pe=zeros(1,numStep); % Previous experience
    Pa=zeros(1,numStep); % Percieved personal autonomy
    Ss=zeros(1,numStep); % Social support
    Tr=zeros(1,numStep); % Trait
    Pn=zeros(1,numStep); % Personality

% Instantanious variables
    Sd=zeros(1,numStep); % Situation demand
    Th=zeros(1,numStep); % task specific threat
    Cr=zeros(1,numStep); % Coping resources
    Sy=zeros(1,numStep); % Sensitivity
    Bw=zeros(1,numStep); % Belief about worry
    Sw=zeros(1,numStep); % Short-term worry
    Tc=zeros(1,numStep); % Thought control
```

```
% Temporal variables
    Lw=zeros(1,numStep); % Long-term Motivation
    Ap=zeros(1,numStep); % Long-term Persistence

% Initializing temporal Factors

    Lw(1)=0.2;
    Ap(1)=0.2;

 % initializing external factors
 % creating scenarios

 Scenario=3;

   for t=1:numStep
   switch (Scenario)

     case(1)
        Rd(t)=0.1;
        Td(t)=0.9;
        Se(t)=0.1;
        Pe(t)=0.1;
        Pa(t)=0.1;
        Ss(t)=0.1;
        Tr(t)=0.9;
        Pn(t)=0.1;
    case(2)
        Rd(t)=0.9;
        Td(t)=0.1;
        Se(t)=0.9;
        Pe(t)=0.9;
        Pa(t)=0.9;
        Ss(t)=0.9;
        Tr(t)=0.1;
        Pn(t)=0.9;

    case(3)
        Rd(t)=0.9;
        Td(t)=0.1;
        Se(t)=0.9;
        Pe(t)=0.9;
        Pa(t)=0.9;
        Ss(t)=0.9;
        Tr(t)=0.9;
        Pn(t)=0.1;


   end

   end

% initialize Internal Factors at time, t=1
```

```
    t=1;
    Sd(t)=Td(t)*(1-Rd(t));
    Cr(t)=(Wcr1*Pe(t)+Wcr2*Ss(t)+Wcr3*Se(t)+Wcr4*Pa(t));

    Th(t)=(Sd(t)*(1-Cr(t)));
    Sy(t)=Tr(t)*(1-(alphaSy*(Pn(t))+(1-alphaSy)*Cr(t)));
    Bw(t)=gammaBw*(betaBw*Th(t)+(1-betaBw)*Lw(t))+ (1-gammaBw) * Sy(t);
    Sw(t)=(phiSw*Bw(t)+(1-phiSw)*Th(t))*(1-(psiSw*Cr(t)+(1-psiSw)*Ap(t)));
    Tc(t)=Ap(t)*(1-Lw(t));

%/////////////////////////////////////////////////////////////////////

% Run the Model at time t=2 to last time

for t = 2:numStep

    % Instantaneous Factors
    Sd(t)=Td(t)*(1-Rd(t));
    Cr(t)=(Wcr1*Pe(t)+Wcr2*Ss(t)+Wcr3*Se(t)+Wcr4*Pa(t));

    Th(t)=(Sd(t)*(1-Cr(t)));
    Sy(t)=Tr(t)*(1-(alphaSy*(Pn(t))+(1-alphaSy)*Cr(t)));
    Bw(t)=gammaBw*(betaBw*Th(t)+(1-betaBw)*Lw(t-1))+ (1-gammaBw) * Sy(t);
   % Bw(t)=0.3*(betaBw*Th(t)+(1-betaBw)*Lw(t-1)) + 0.7* Sy(t);
    Sw(t)=(sigmaSw*Bw(t)+(1-sigmaSw)*Th(t))*(1-(psiSw*Cr(t)+(1-psiSw)*Ap(t-1)));
   % Sw(t)=(0.7*Bw(t)+0.3*Th(t))*(1-(psiSw*Cr(t)+(1-psiSw)*Ap(t-1)));
    Tc(t)=Ap(t-1)*(1-Lw(t-1));


   % temporal factors

    % Accumulative Appraisal
    Zx =(Wzx*Cr(t)+(1-Wzx)*Tc(t))*(1-Bw(t))*(1-Sy(t));

    if (Zx-Ap(t-1)>0)
      Ap(t)=Ap(t-1)+ betaAp*((Zx-Ap(t-1))*(1-Ap(t-1)))*Delta_t;
    else
      Ap(t)=Ap(t-1)+ betaAp*((Zx-Ap(t-1))*Ap(t-1))*Delta_t;
    end

    % Accumulative Short-term Worry
    if (Sw(t)-Lw(t-1)>0)
      Lw(t)=Lw(t-1)+ alphaLw * ((Sw(t)-Lw(t-1))*(1-Lw(t-1)))*Delta_t;
    else
      Lw(t)=Lw(t-1)+ alphaLw * ((Sw(t)-Lw(t-1))*Lw(t-1))*Delta_t;
    end


 end
% plotting graphs
%x = linspace (300,1,500);
hold on
t=1:numStep;
```

```
 subplot(2,1,1);
 y=plot(t,Sd,'k-.', t,Th,'b-', t,Cr,'r--',t,Bw,'m--');

 xlabel('time steps');ylabel('levels');
 xlim([0 numStep]);ylim([minLimX maxLimY]);
% hold off;
 legend(y,'sit. demand', 'Threat', 'coping res.','Blv worry');
%..........................................................................
 subplot(2,1,2);
 y=plot(t, Sw,'k-.',t, Lw,'r-',t, Ap,'b--');
 xlabel('time steps');ylabel('levels');
 xlim([0 numStep]);ylim([minLimX maxLimY]);

 legend(y,'ST worry', 'LT Worry', 'Appraisal');
 hold off;
%..........................................................................
```

Appendix J

Simulation Code for Integrated Agent of an Interviewee Mental State

```
%Integrated Model
%Intializing all parameters to regulate the equations
     maxLimY = 1;
    minLimX = 0;
    numStep = 500; % 2 hours of interview (120 mins)
    Delta_t = 0.2; % Change in time
    % parameters of Instantanious factors

 % ********************** ANXIETY **************************

    phiSw = 0.9;
     % Wcr1 = 0.25; Wcr2= 0.25; Wcr3=0.25; Wcr4=0.25;   ^^^^^ ALREADY
    % SPECIFIED IN MOTIVATION
    alphaCr=0.5;
    gammaBw = 0.2;
    alphaSy = 0.5;
    Wbw = 0.5;
    psiSw = 0.1;

    % temporal parameters

    Wzx = 0.1;
    betaAp=0.5;   % Accumulative Short term Persistence
    alphaLw=0.8;  % Accumulative Short term worry

% ********************** ANXIETY *************************
% ***************   MOTIVATION ***************************
    Wpa = 0.5;
    Wcr1=0.25; Wcr2=0.25; Wcr3=0.25; Wcr4=0.25;
    Wpd1=0.5;
    Wpd2=0.5;
    gammaSk = 0.5;
    Wsk=0.5;
    Wg=0.5;

    Wpc1=0.33;
    Wpc2=0.33;
    Wpc3=0.34;
    alphaEp = 0.5;
    Wep = 0.5;
    Wep1 = 0.5;

    alphaCv=0.5;

    lamdaVe = 0.5;
    lamdaSm=0.1;
```

```
    phiSp = 0.5;
    miuMl=0;
    betaLm = 0.5;
    gammaLp = 0.3;
% ********************* MOTIVATION END ******************
% ----------------------SELF-EFFICACY------------------------------------
   Was = 0.5;    % Weight of Anxiety in Affective State. (1-Was) for Basic Efficacy
   Wex = 0.5;    % Experience
   Wei = 0.5; % For Experience in Efficacy information. (1-Wei) for Verbal persuation
   betaBe = 0.8;  % Social support in Basic Efficacy. (1-betaBe) for Mastery Experience
%   gammaSk= 0.5;  % For skill. (1-gammaSk) for Long term persistence
   Wgp1=0.34; Wgp2=0.33; Wgp3=0.33;
    phiGp = 0.5;   % inner factors for personal goal. (1-phiGp) for progress towards goal
    rhoGp = 0.5;   % Basic efficacy in Personal Goal. (1-rhoGp) for Mastery experience
    Wsp1 = 0.25;    % weight of Basic Efficacy in Short-Term Persistence.
    Wsp2 = 0.25;    % weight of short-term engagement in Short-Term Persistence.
    Wsp3 = 0.25;    % weight of goal in Short-Term Persistence.
    Wsp4 = 0.25;    % weight of long-term efficacy in Short-Term Persistence.
    betaSe = 0.5;  % Internal factors [Be, Sp]of Short-Term engagement. (1-betaSe) for external factors [Pg,Gf].
    Wse1 = 0.5;     % Basic Efficacy in Short-Term Cognitive engagement. (1-Wse1) for short term persistence
    Wse2 = 0.5;    % Progress towards goal in Short-Term Cognitive engagement. (1-Wse2) for Generated effort
    alphaEa = 0.5; % Internal factors [Ei, Gp]of Efficacy appraisal. (1-alphaEa) for external factors [Le,Mf].
    Wea1 = 0.8;    % Efficacy information in Efficacy Appraisal. (1-Wea1) for personal goal
    Wea2 = 0.5;    % Long-term cognitive engagement in Efficacy Appraisal. (1-Wea2) for Mental effort
    gammaMf = 0.5; % External factors [Gp, Gf]of mental Effort. (1-gammaMf) for internal factor [Be].
    psiMf = 0.5;   % Personal goal in Mental Effort. (1-psiMf) for Generated effort.
    Wgf = 0.5;    % Mental effort in Generated effort. (1-Wgf) for short-term efficacy
    Wpg1 = 0.33;    % Short-term efficacy in Progress towards goal
    Wpg2 = 0.33;    % Long-term persistence in Progress towards goal
    Wpg3 = 0.33;    % Mental effort in Progress towards goal
    lamdaSf = 0.2; % Internal factors [Be, Ea, Lp]of Short-term Efficacy. (1-lamdaSf) for external factors [Gp].
    Wsf1 = 0.33;    % Basic efficacy in short-term efficacy
    Wsf2 = 0.33;    % Efficacy appraisal in short-term efficacy
    Wsf3 = 0.33;    % Long term persistence in short-term efficacy
    Wlp = 0.5;     % sgot termpersistence in long term persistence. (1-wlp) for

    betaLe = 0.9;  % Accumulative Short term Cognitive Engagement
    alphaLp = 0.9; % Accumulative Short term Persistence
   % gammaSf = 0.9; % Short term efficacy
    gammaLf = 0.9; % Accumulative Short term Self Efficacy
 % ----------------------SELF-EFFICACY ENDS-------------------------------

%DECLARE ALL VARIABLES AND SET initial VALUES TO EXTERNAL factors
% External variables
  %=========== aNXIETY =========
    Rd=zeros(1,numStep); % dEFINED ALREADY
    Td=zeros(1,numStep); % dEFINED ALREADY
    Sef=zeros(1,numStep); % dEFINED ALREADY
    Pe=zeros(1,numStep); % dEFINED ALREADY
```

```
    Pa=zeros(1,numStep); % dEFINED ALREADY
    Ss=zeros(1,numStep); % dEFINED ALREADY
    Tr=zeros(1,numStep); % Trait
    Pn=zeros(1,numStep); % Personality

  %=========== mOTIVATION =========
   % Pa=zeros(1,numStep);
   % Rd=zeros(1,numStep);
   % Ss=zeros(1,numStep);
   % Td=zeros(1,numStep);
   % Pe=zeros(1,numStep);
   % Se=zeros(1,numStep);

 %=========== sELF-EFFICACY=========
    Ax=zeros(1,numStep); % Anxiety - Arousal interpretation
    Vp=zeros(1,numStep); % Verbal persuasion
    Vx=zeros(1,numStep); % Vicarious experience
  % Me=zeros(1,numStep); % Mastery experience-dEFINED AS PRIOR EXPERINCE
  % Ss=zeros(1,numStep); % Social support - dEFINED ALREADY
  % Ps=zeros(1,numStep); % Personality
  % Td=zeros(1,numStep); % Task Demand

  % Instantanious variables

    Lp=zeros(1,numStep);
  %=========== mOTIVATION =========
    Sd=zeros(1,numStep);
    Cr=zeros(1,numStep);
    Pd=zeros(1,numStep);
    Sk=zeros(1,numStep);
    Th=zeros(1,numStep);
    Gl=zeros(1,numStep);
    Pc=zeros(1,numStep);
    SpM=zeros(1,numStep);
    Ep=zeros(1,numStep);
    Av=zeros(1,numStep);
    Cv=zeros(1,numStep);
    Ve=zeros(1,numStep);
    Sm=zeros(1,numStep);
%=========== aNXIETY =========
  % Sd=zeros(1,numStep); % dEFINED ALREADY
  % Th=zeros(1,numStep); % dEFINED ALREADY
  % Cr=zeros(1,numStep); % dEFINED ALREADY
    Sy=zeros(1,numStep); % Sensitivity
    Bw=zeros(1,numStep); % Belief about worry
    Sw=zeros(1,numStep); % Short-term worry
    Tc=zeros(1,numStep); % Thought control
%=========== sELF-EFFICACY =========
    As=zeros(1,numStep); % Affective state
    Ex=zeros(1,numStep); % Experience
    Ei=zeros(1,numStep); % Efficacy Information
    Be=zeros(1,numStep); % Basic Efficacy
  % Pd=zeros(1,numStep); % Percieved Task Difficulty
```

```
  % Sk=zeros(1,numStep); % Skill
    Gp=zeros(1,numStep); % Personal Goal
    SpE=zeros(1,numStep); % Short-term persistence
    Se=zeros(1,numStep); % Short-term congitive engagement
    Ea=zeros(1,numStep); % Efficacy appraisal
    Mf=zeros(1,numStep); % Mental Effort
    Gf=zeros(1,numStep); % Generated Effort
    Pg=zeros(1,numStep); % Progress towards Goal
    Sf=zeros(1,numStep); % Short-term Self Efficacy

% Temporal variables
  %=========== mOTIVATION =========
    Lm=zeros(1,numStep);
    LpM=zeros(1,numStep);
 %=========== aNXIETY =========
    Lw=zeros(1,numStep);
    Ap=zeros(1,numStep);
 %=========== sELF-EFFICACY =========
    LpE=zeros(1,numStep); % Long-term Persistence
    Le=zeros(1,numStep); % Long-term cognitive engagement
    Lf=zeros(1,numStep); % Long-term Self Efficacy
% Initializing temporal Factors
   %=========== aNXIETY =========
    Lw(1)=0.0;
    Ap(1)=0.2;
%     Lw(1)=0.3;
%     Ap(1)=0.3;
 %=========== mOTIVATION =========
    Lm(1)=0.0;
    LpM(1)=0.1;

%     Lm(1)=0.2;
%     LpM(1)=0.2;
 %=========== sELF-EFFICACY =========
    LpE(1)=0.3;
    Le(1)=0.3;
    Lf(1)=0.1;
%     LpE(1)=0.1;
%     Le(1)=0.1;
%     Lf(1)=0.1;
% creating scenarios
Scenario=1;
  for t=1:numStep
  switch (Scenario)
    case(1)
        Pe(t)=0.2;
        Vx(t)=0.2;
        Pa(t)=0.4;
        Pn(t)=0.4;
        Ss(t)=0.5;
        Tr(t)=0.8;
        Td(t)=1;
        Vp(t)=0.3;
```

```
        Rd(t)=0.1;

        SKnorm = 0.1;

     case(2)
        Pa(t)=0.1;
        Rd(t)=0.1;
        Ss(t)=0.1;
        Td(t)=0.9;
        Pe(t)=0.1;
        SKnorm = 0.1;

        Tr(t)=0.9;
        Pn(t)=0.1;

        Vp(t)=0.1;
        Vx(t)=0.1;

    case(3)
        Pa(t)=0.9;
        Rd(t)=0.9;
        Ss(t)=0.9;
        Td(t)=0.1;
        Pe(t)=0.9;
        SKnorm = 0.8;
        Tr(t)=0.2;
        Pn(t)=0.9;
        Vp(t)=0.9;
        Vx(t)=0.9;

    case(4)
        Pa(t)=0.1;
        Rd(t)=0.1;
        Ss(t)=0.1;
        Td(t)=0.9;
        Pe(t)=0.1;
        SKnorm = 0.1;

        Tr(t)=0.1;
        Pn(t)=0.9;

        Vp(t)=0.1;
        Vx(t)=0.1;
   end

   end

% initialize Internal Factors at time, t=1
    t=1;
  %=========== mOTIVATION =========
    Pa(t) = Wpa*Pa(t) + (1-Wpa)* Av(t);
    Sd(t) = Pd(t)*(1-Rd(t));
    Cr(t)= Wcr1*Pe(t)+Wcr2*Ss(t)+Wcr3*Be(t)+Wcr4*Pa(t);
```

```
    Sk(t) = gammaSk * SKnorm + (1-gammaSk)*(Wsk*Pe(t)+(1-Wsk)*Lp(t));
    Pd(t)=Td(t)*(1-(Wpd1*Pe(t)+Wpd2*Sk(t)));
    Th(t)=Sd(t)*(1-Cr(t));
    Pc(t)=Wpc1*Cr(t)+Wpc2*Sk(t)+Wpc3*Pe(t);
    Gl(t)= (Pc(t)+Pd(t))*(1-Th(t));
          Ep(t) = (alphaEp *(Wep*Pc(t) + (1-Wep)*Cr(t))+(1-alphaEp)*(Wep1*Gl(t)+ (1-
Wep1)*Ve(t)));%*(1-Pd(t));
    Av(t) = Ep(t)* (1-Th(t));
    Cv(t) = alphaCv*Pd(t) + (1-alphaCv)*(Gl(t)+ Ep(t))*LpM(t);
    Ve(t) = lamdaVe * Av(t) + (1-lamdaVe)*Cv(t);
    Sm(t) = lamdaSm*Ve(t) + (1-lamdaSm)*Ep(t);
    SpM(t) = (phiSp * Se(t) + phiSp*Sm(t)) * Gl(t);

   %============ aNXIETY ============================================

   %  Sd(t)=Td(t)*(1-Rd(t));        dEFINED ALREADY
   %  Cr(t)=(Wcr1*Pe(t)+Wcr2*Ss(t)+Wcr3*Se(t)+Wcr4*Pa(t));dEFINED ALREADY
   %  Th(t)=(Sd(t)*(1-Cr(t))); dEFINED ALREADY
     Sy(t)=Tr(t)*(1-(alphaSy*(Pn(t))+(1-alphaSy)*Cr(t)));
     Bw(t)=gammaBw*(Wbw*Th(t)+(1-Wbw)*Lw(t))+ (1-gammaBw) * Sy(t);
     Sw(t)=(phiSw*Bw(t)+(1-phiSw)*Th(t))*(1-(psiSw*Cr(t)+(1-psiSw)*Ap(t)));
     Tc(t)=Ap(t)*(1-Lw(t));

  %============ sELF-EFFICACY ========================================

     Be(t) = (betaBe * Ss(t) + (1-betaBe)* Pe(t)) * Pn(t);
     As(t) = Lw(t) * (1-Be(t));
     Ex(t) = Wex * Pe(t) + (1-Wex)*Vx(t);
     Ei(t) = (Wei * Ex(t) + (1-Wei) * Vp(t)) * (1 - As(t));

     Gp(t)=  (Wgp1*Be(t)+Wgp2*Pe(t)+Wpg3*Pg(t))*(1-Pd(t));
     Se(t) = betaSe * (Wse1*Be(t)+(1-Wse1) * Sk(t)) + (1-betaSe) * (Wse2*Pg(t) + (1-Wse2)*Gf(t));

     SpE(t) = Wsp1 * Lm(t) + Wsp2*Se(t) + Wsp3*Gp(t) + Wsp4*Lf(t);

     Ea(t) = alphaEa * (Wea1*Ei(t) + (1-Wea1)*Gp(t)) + (1-alphaEa) * (Wea2*Le(t) + (1-Wea2)*Mf(t));
     Gf(t) = Wgf * Mf(t) + (1-Wgf) * Sf(t);
     Mf(t) = gammaMf * (psiMf*Gp(t) + (1-psiMf)*Gf(t)) + (1-gammaMf)*Be(t);

     Pg(t) = Wpg1 * Sf(t) + Wpg2 * LpE(t) + Wpg3 * Mf(t);
     Sf(t) = lamdaSf * (Wsf1*Gp(t) + Wsf2*Ea(t) + Wsf3*LpE(t)) + (1-lamdaSf)*Be(t);


    % ########################################################################
     Lp(t) = 0.5*LpM(t) + 0.5*LpE(t);

% Run the Model at time, t=2
lamda=0.01;
flag=0;

for t = 2:numStep

     % Instantaneous Factors
```

```
 %=========== mOTIVATION ==========
  Pa(t) = Wpa*Pa(t) + (1-Wpa)* Av(t-1);
  Sd(t)=Td(t)*(1-Rd(t));
  Cr(t)= Wcr1*Pe(t)+Wcr2*Ss(t)+Wcr3*Be(t-1)+Wcr4*Pa(t);
  Pd(t)=Td(t)*(1-(Wpd1*Pe(t)+Wpd2*Sk(t)));
  Sk(t) = gammaSk * SKnorm + (1-gammaSk)*(Wsk*Pe(t)+(1-Wsk)*Lp(t-1));
  Th(t)=Sd(t)*(1-Cr(t));
  Pc(t)=Wpc1*Cr(t)+Wpc2*Sk(t)+Wpc3*Pe(t);
  Gl(t)= (Pc(t)+Pd(t))*(1-Th(t));
        Ep(t) = (alphaEp *(Wep*Pc(t) + (1-Wep)*Cr(t))+(1-alphaEp)*(Wep1*Gl(t)+ (1-Wep1)*Ve(t-
1)));%*(1-Pd(t));
  Av(t) = Ep(t)* (1-Th(t));
  Cv(t) = alphaCv*Pd(t) + (1-alphaCv)*(Gl(t)+ Ep(t))*Lp(t-1);
  Ve(t) = lamdaVe * Av(t) + (1-lamdaVe)*Cv(t);
  Sm(t) = lamdaSm*Ve(t) + (1-lamdaSm)*Ep(t);
  SpM(t) = (phiSp * Se(t) + phiSp*Sm(t)) * Gl(t);
  % temporal factors
   if (Sm(t)-Lm(t)>0)
     Lm(t)=Lm(t-1)+betaLm*(Sm(t)-Lm(t-1))*(1-Lm(t-1))*Delta_t;
   else
     Lm(t)=Lm(t-1)+betaLm*(-(Sm(t)-Lm(t-1)-lamda))*Lm(t-1)*Delta_t;
   end

   LpM(t) = Lp(t-1) + gammaLp * (SpM(t)- LpM(t-1))* LpM(t-1) * (1-LpM(t-1)) * Delta_t;

 %=========== aNXIETY ================================================
 %  Sd(t)=Td(t)*(1-Rd(t));       dEFINED ALREADY
 %  Cr(t)=(Wcr1*Pe(t)+Wcr2*Ss(t)+Wcr3*Se(t)+Wcr4*Pa(t)); dEFINED ALREADY
 %  Th(t)=(Sd(t)*(1-Cr(t)));      dEFINED ALREADY
   Sy(t)=Tr(t)*(1-(alphaSy*(Pn(t))+(1-alphaSy)*Cr(t)));
   Bw(t)=gammaBw*(Wbw*Th(t)+(1-Wbw)*Lw(t-1))+ (1-gammaBw) * Sy(t);
   Sw(t)=(phiSw*Bw(t)+(1-phiSw)*Th(t))*(1-(psiSw*Cr(t)+(1-psiSw)*Ap(t-1)));
   Tc(t)=Ap(t-1)*(1-Lw(t-1));

 % temporal factors
  Zx =(Wzx*Cr(t)+(1-Wzx)*Tc(t))*(1-Bw(t))*(1-Sy(t));

   if (Zx-Ap(t-1)>0)
     Ap(t)=Ap(t-1)+ betaAp*((Zx-Ap(t-1))*(1-Ap(t-1)))*Delta_t;
   else
     Ap(t)=Ap(t-1)+ betaAp*((Zx-Ap(t-1))*Ap(t-1))*Delta_t;
   end
   if (Sw(t)-Lw(t-1)>0)
     Lw(t)=Lw(t-1)+ alphaLw * ((Sw(t)-Lw(t-1))*(1-Lw(t-1)))*Delta_t;
   else
     Lw(t)=Lw(t-1)+ alphaLw * ((Sw(t)-Lw(t-1))*Lw(t-1))*Delta_t;
   end
%============== sELF-EFFICACY =============================================
  Be(t) = (betaBe * Ss(t) + (1-betaBe)* Pe(t)) * Pn(t);
  As(t) = Lw(t) * (1-Be(t));
  Ex(t) = Wex * Pe(t) + (1-Wex)*Vx(t);
  Ei(t) = (Wei * Ex(t) + (1-Wei) * Vp(t)) * (1 - As(t));
  %Sk(t)= gammaSk * SKnorm + (1 - gammaSk) * Lp(t); TAKEN CARE OF
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    %Pd(t)= Td(t) * (1-Sk(t));
   Gp(t)=  (Wgp1*Be(t)+Wgp2*Pe(t)+Wpg3*Pg(t-1))*(1-Pd(t));
  % Gp(t)= phiGp * ((rhoGp*Be(t)+(1-rhoGp)*Pe(t))*(1-Pd(t)))+(1-phiGp)* Pg(t);

 % SpE(t) = Wsp1 * Be(t) + Wsp2*Se(t) + Wsp3*Gp(t) + Wsp4*Lf(t);

   Se(t) = betaSe * (Wse1*Be(t)+(1-Wse1) * Sk(t)) + (1-betaSe) * (Wse2*Pg(t-1) + (1-Wse2)*Gf(t-1));
   SpE(t) = Wsp1 * Lm(t) + Wsp2*Se(t) + Wsp3*Gp(t) + Wsp4*Lf(t-1);
   Ea(t) = alphaEa * (Wea1*Ei(t) + (1-Wea1)*Gp(t)) + (1-alphaEa) * (Wea2*Le(t-1) + (1-Wea2)*Mf(t-1));
   Gf(t) = Wgf * Mf(t-1) + (1-Wgf) * Sf(t-1);
   Mf(t) = gammaMf * (psiMf*Gp(t) + (1-psiMf)*Gf(t)) + (1-gammaMf)*Be(t);
   Pg(t) = Wpg1 * Sf(t-1) + Wpg2 * LpE(t-1) + Wpg3 * Mf(t);
   Sf(t) = lamdaSf * (Wsf1*Gp(t) + Wsf2*Ea(t) + Wsf3*LpE(t-1)) + (1-lamdaSf)*Be(t);
% temporal factors
    Le(t)= Le(t-1) + betaLe * (Se(t) - Le(t-1))* Le(t-1) * (1-Le(t-1))* Delta_t;
    LpE(t) = LpE(t-1) + alphaLp * (SpE(t)- LpE(t-1))* LpE(t-1) * (1-LpE(t-1)) * Delta_t;
    Lf(t) = Lf(t-1) + gammaLf * (Sf(t) - Lf(t-1)) * Lf(t-1) * (1-Lf(t-1)) * Delta_t;

%=========== working variable computation=========
 Lp(t) = 0.5*LpM(t) + 0.5*LpE(t);

end
% plotting graphs
%x = linspace (300,1,500);
hold on
t=1:numStep;
 %subplot(3,1,1);
 y=plot(t,Lw,'b-', t, Lm, 'k-', t, Lf, 'r-');
 %y=plot(t, Ap,'m-.',t, Lw,'b--', t, LpM, 'k--',t, Lm, 'g-', t, Le, 'k-', t, LpE, 'b-', t, Lf, 'r-');
 xlabel('time steps');ylabel('levels');
 xlim([0 numStep]);ylim([minLimX maxLimY]);
% hold off;
 legend(y,'Anxiety', 'Motivation','Self-efficacy');
 %legend(y,'Appraisal',   'Anxiety',   'Persistence(M)',   'Motivation','Engagement','Persistence   (F)',   'Self-efficacy');
%.......................................................................
%  subplot(3,1,2);
%  y=plot(t, Sm,'k-.',t, Lm,'b--',t, LpM,'r--');
%  xlabel('time steps');ylabel('levels');
%  xlim([0 numStep]);ylim([minLimX maxLimY]);
%
%  legend(y,'Motivation ST', 'Motivation LT', 'Persistence LT');
%
% %.......................................................................
%  subplot(3,1,3);
%  y=plot(t, Le,'k-.',t, LpE,'b--',t, Lf,'r--');
%  xlabel('time steps');ylabel('levels');
%  xlim([0 numStep]);ylim([minLimX maxLimY]);
%
%  legend(y,'Engagement ST', 'Persistence LT', 'Efficacy LT');

 hold off;
%.......................................................................
```