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AI Applications in Psychology

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1. Introduction

The AI role in psychology is still underestimated by the European psychology experts. Sometimes psychologists reject the use of expert systems in their fields of activity because they fear that the computer will replace them. Sometimes they do not perceive the full potential of using IT. The same reactions have been encountered among medicine doctors when the first automatic diagnose system was tested. The AI has not reached yet that level of performance capable of emulating simultaneously all pieces of human behaviour, but researchers are on the right track of getting there (Klein, 1999). Anyhow, there are many intersection points between these two domains.

One intersection is related to the cognitivist approach in psychology. Within this domain, various programs have been developed for environment simulation, automatic emotion recognition, the simulations of social interaction within groups, phobias therapies, computer aided treatment in psychiatry, electronic inquires and automatic results generation, and the list may continue. In the UK, studies related to the efficiency in applying IT in cognitive behaviour therapy have already been conducted (NICE, 2008) and the results are promising. The importance of IT in psychology was recognised by the researchers' community by developing a new area of research – cyberpsychology.

Two distinct levels of IT use in psychotherapy have already been identified (Hovell & Muller, 2010), especially from the patient treatment point of view. Within the first layer, we encounter the common tools developed to increase the efficiency and performance of the therapist. Within the second level, we have the complex systems that help both the patient and the therapist during the treatment. There is a strong possibility that in the future low and medium complexity problems will be handled by the expert systems. Although there are some applications that sustain these assumptions, some controversies on the subject still exist (Marks et al., 2007). In the second part of this chapter, a new approach in information retrieval and testing will be presented.

For the researcher, two information flows are critical. One refers the new discoveries regarding the global research within his area of interest. The other consists of the experimental data needed for his research. Because psychologists measure the thoughts, feelings and behaviour of one or more people at a time, they have a problem in acquiring research data, especially when large numbers of subjects are needed. At a corporate level, this problem is solved by using the electronic version of classical inquires. Though, this solution is limited to a medium where there are strong rules that guide employee behaviour. On the other hand, young people are more and more adapted to the information society. As

a result, the use of cooperative layers provided by the IT permit them to interact in various spaces - more or less virtual.
The psychologists need new tools in order to gather data not only from the point of view of social psychology, where the information about human behaviour can be retrieved without direct interviewing, but also from the point of view of other fields of psychology. As a result, we need a combination between an expert system, an information retrieval system and an intelligent interface to mediate user interaction in order to fulfill these needs. The human computer interface will also have its role in agent interface design.

2. Information technology and psychology

The computer begins to be more and more used in the psychology and psychiatry research or treatment. Not all the experts consider that level of implication as being positive. (Seong-in et al., 2006). In the following section we will analyse their opinions and try to see if there are any alternative ways of solving the controversies.
The classical approach of the domain considers as acceptable only the direct human to human interaction during the treatment. Nowadays, with the informational society becoming more and more part of our life, the idea of human interaction is being altered by the IT tools. For example, personalized wide area communications like telepresence reach the stage of holographic representation of the person on remote (Musion, 2011). Other impersonal or partial personalized methods of communication are the continuously growing as social networks and virtual spaces for collaborative work or relaxing. As a result, the acceptance level of human computer interaction will continuously increase year after year, until this rule will slightly dissipate by itself.
The use of computers can lead, on long term, to significant decreases in the financial flows of this class of experts. This it is possible to happen at the beginning of the process. A free market will quickly adapt in one or two decades and a new equilibrium point will be found.
Because it will be a long time or even so until a computer will have the flexibility and dynamism of a human mind, it is clear that in computer patient relationship a loss of rigor and quality may appear. Yet, this can be avoided by readapting the treatment schemas in order to maximize the advantages offered by the computerized system and to minimize the undesired effects. Anyhow, the current stage in this domain shows that the computer-assisted or computer-replaced therapy cannot be used in any field psychology or psychiatry because it cannot give the minimal required level of quality of treatment.
In terms of organizational resistance, this represents a minor problem on long term. The organization must adapt to the economic and social changes of the society; otherwise it will perish.
Regarding the patient resistance, the same arguments as previously fit very well. The evolution of information society and of the cyberspace will enter in people's life from birth. As a consequence, many things related to human computer interaction will became natural.
Similar rejection reactions have been encountered among medicine doctors when the first automatic diagnostic system was tested like Micyn (Hance, 1976). Unfortunately the Micyn use was prohibited because they do not accept possible liabilities that can appear in case of wrong diagnose, Caduceus (Banks, 1986), or ONCOCIN (Wiederhold et al., 2001). An expert system can reach up to 99% of diagnostic correctness but in the same condition as the medic itself because also need a full and detailed anamnesis. As a result, they remain as help, not as replacement.

Anyhow, nowadays the problem is so important that a new field in social science was created: the cyberpsychology or the psychology of cyberspace. The definition given by Suller (Suller, 2011) is :

"the psychological aspects of environments created by computers and online networks. It presents an evolving conceptual framework for understanding how people react to and behave within cyberspace"

The research of the cyberpsychology is oriented on two main directions:

- How can the IT applications improve the treatment of various psychological problems?
- What are the typical psychological and psychiatric problems that appear when people interact with various tool of the cyberspace?

The new concept emerged naturally when the information society began to be so involved in each aspect of everyday life, and the psychologists began to increase the number and the diversity of the studies related to the use of IT applications.

If we look at the complexity and purposed of the typical IT applications used in real world or into the research laboratories, we see that they usually try to solve only one type or class of problems, and that their complexity is variable. In most cases, the systems used have medium or low complexity. As a result, when the first design of the hardware and software system was emerged, some questions appeared:

- It is rational to make the investments needed to implement a complex system like that?
- The system will really meet the psychology expert needs?
- The user (the psychologist) can adapt to the complexity of this system?

To solve the first question some tests about the system efficiency conducted using a minimal prototype are needed. As for the rest of the mentioned problems of user rejection, they can be easily handled by the use of some feature specific for human computer interface – HCI. Unfortunately, those features will remain at the gadget level without the existence of a good information system based also on an expert system. This means that a simple electronic documentation also called "Help" cannot solve the problem. A more interactive approach will be the use of Intelligent Tutoring Systems – ITS. The ITS is based on an expert system and it requires a "touch" from the combination between authoring event and psychology in order to increase the abilities in handling the customized help offered to the teacher to develop new materials and also how to use them in the context of an ITS (Major et al., 1997).

Haynes proves widely in his PhD thesis the necessity of using the expert systems in information system instead of a simple indexed help file, so that each application that passes over a certain degree of complexity should provide to the user the needed help on each moment of interaction with the system (Hayes, 2003). The approach was improved using so called "situation awareness". Here the concept of smart monitor is used having in mind usually military applications. They represent, in fact, the use of a smart information system in order to change the definition/perception of the display. The transformation is from a simple report that it made from the system's point of view to one that reflects the user's point of view (Guastello, 2007).

The main applications of computer in psychology refer especially to psychotherapy. Here there are a broad band of applications that can be classified as follows (Newman, 2004):

- self – help Internet sites;
- computer administered therapy;
- screening and assessment using web applications over the Internet;
- adjunctive palmtop computer therapy;

- on-line consultation;
- advocacy;
- virtual reality therapy;
- interactive voice messaging systems;
- biofeedback via ambulatory physiological monitoring;
- virtual spaces for support groups (can be based on social networks instruments or by a custom solution).

The main advantages offered by the use of IT in psychotherapy are:

- supplementary time for supervised treatment gained by the patient;
- decrease the time append in direct interaction with the practitioner;
- decrease de cost of the treatment ;
- some help in taking treatment decisions;

The idea of using the computer to help the expert is not new. This was needed especially because of the time consuming tasks like taking interviews. At this level, the computer has more advantages than a human in the same position (Erdman et al., 1985). Yet the roots of artificial intelligence in cognitivism have made the psychiatrists to try to use the computer as help during the treatment process.

The use of computer in psychotherapy has not only some advantages, but also some disadvantages. Some of them are of ethical nature. This refers to the bond created between the expert and the patient. As a result, one big question refers the correctness of leaving a human being into this type of relationship (Rialle et al., 1994). The other problem appears because the software can be bought and used by the patient on free will. This situation is similar to the case of drugs that can be used only under continuous medical supervision because of their extreme danger. There is also the possibility to decrease the adaptability and ability of the human expert because the computer models sometimes need to simplify things too much. As a consequence, in time there is a possibility that the expert will not be able to think "outside the computer box". Yet, there are a lot of advantages of the computer use at any level in psychology, but with the proper caution.

The assisted cognitive psychotherapy has been tested since the 90', and the result seem to be encouraging (Wood et al., 1998). The Computer aided Cognitive Behavioural Therapy – CCBT - is used in conjunction with the psychotherapist and, based on patient input, it can suggest some general directions in patient treatment and even handle some portion of it (Marks et al., 2007). As in other applications, the use of these systems during the therapeutic process can decrease the time spent by the specialist with the patient, but dramatically increase the time of treatment appliance due to electronic supervision. Because in most cases the key of success is increasing as much as possible the time allocated by the patient to the supervised treatment, than there are many expectations from this approach. Yet the system has its limitations. For example, until now it cannot offer solutions to problems like compulsive gambling, nightmares, enuresis and tics. This is expected due to gravity and complexity of mentioned problems. So we may argue that these systems are useful and that they will be continuously developed, but there is no way that they entirely replace the specialist yet.

The hypnotherapy may be conducted in a classic manner, but good effects are also obtained by the use of various partially or totally electronic techniques. Because the computer can fully control the audio/video flow in whatever manner is necessary, the IT involvement in this field is higher. In Table 1, the techniques and methods mostly used in conjunction with a computer are presented (Frost. 2008).

Nowadays, the use of virtual reality has become accepted in the health care services in order to help the psychotherapist. The specialists begin to consider that the VR role will continuously increase in the future within the field of clinical psychology (Riva, 2005).

Problem	Recommended techniques	Used Methods
Stress	Self hypnosis	Interactive web applications
Anxiety	Hypnotherapy	Interactive web applications
Depression	Relaxation therapy	Stand alone applications
Phobias on various forms	Meditation	Multimedia support
Cognitive issues (e.g. positive thinking)	Stress management	Mini mixing desks

Table 1. Computer based hypnotherapy usage

In panic and phobia disorders treatment, the results of using computer application were not so impressive; though from an economic efficiency point of view there was a real success (McCrone et al., 2009).
The games are already used in education of children of different ages, so this potential has reach the psychiatrist expert attention. So, the concept of using games in education at various levels of complexity appears. The games are, in most of cases, based on complex expert systems or on other forms of advanced artificial intelligence. The psychologists have not neglected this approach. As a result, studies about using 3D games as focused therapy instruments have been conducted (Coyle et al., 2005). The first results appear to be promising, but it is difficult to find a general treatment solution. Therefore, the therapeutic games need behaviour rules modification from time to time, under the psychiatrist supervision.

3. Expert systems in psychology

Simon presents the idea that a machine can think. But there are two distinct ways in doing that. Of course this "thinking process" will be also programmed - at least in the early stages; than the machine can evolve. He observes that the programming of the machine can be done taking into account the human way of solving problems or not (Simon 1990). But this raises an interesting question regarding the use of expert systems in psychology. Most of the common applications in psychology take the expert system as it is and try to adapt it to their particular or sometimes more general needs. Cognitive simulations are computer programs for modelling human cognitive activities. Traditionally used to develop expert and learner models for intelligent tutoring systems, building simulations is also an effective learning activity in psychology-related courses. Using inexpensive and easy-to-use expert system shells, students can develop simulations of cognitive processes. This will give them the ability to better understand the rational process of human mind and also will improve their communication ability with the IT experts.
Jonassen presents a case study where expert systems were used as formalism for modelling metacognitive processes in a seminar (Jonassen & Wang, 2003). Building cognitive simulations engages intensive introspection, ownership, and meaning making in learners who build them.

The relation between psychology and expert systems is closer that seems at a first glance. In fact, the bases of artificial intelligence - AI - rely on the cognitive approach in psychology. The AI dynamics was higher than the evolution of psychology due to its strong mathematic support and the important industrial applications AI provided. The production systems, and then the expert systems emerged around the 80's as a market asset (Shaw & Gaines, 2005). The links with the origin are not loosed yet. The expert systems need the help of the psychology. After the first wave of enthusiasm, the IT experts have understood that there is a need for development of some techniques to make an efficient rule extraction from people. Here the repertory grid elicitation was recognized as being useful and integrated into the local "know how". From the point of view of psychology, the expert systems can be used in conjunction with personal construct psychology. Unfortunately, the psychologist approach is not economically feasible. But a compromise can be reached if an expert system with generic rules about human behaviour and thinking is developed, and then, in time, a form of self acquiring new rules from direct dialog with the patient will be used.

The expert systems are complex applications that have as their main concern to capture a particular set of rules regarding the experience of a human expert in some particular field. There are some limits in their implementation, but usually applied to dimension of rules set and eventually to clarity of this set. From the computing power point of view, nowadays there are new approaches in high performance computing like GRID or CLOUD computing that can assure all the needed scalability. Probably the complexity of human thinking, of natural language and also its imperfections as a communication channel, may limit the knowledge transfer. The application of these systems is almost unlimited from a theoretical point of view, because at the origin of artificial intelligence – AI – laid the idea of trying to replicate human thinking. But this cannot be one as a whole yet. As a result, various branches of AI try to replicate pieces of life behaviour at any level, beginning with genetic algorithms and neural networks and finishing with artificial life, fuzzy and game theory. Any expert system must have three key components: the knowledge base, the inference engine, and the interface.

The knowledge base can be composed of structured data like tables of numbers, facts, if-then rules, various relationships, critical values, sometime equations or sets of qualitative descriptors.

In order to process this database, a special logic interpreter is used for the inference machine. Inference engines can have different complexity levels. The good news is that the engine can be parallelized (Urbani et al., 2010), so that, into a scalable computing medium, we can solve problems on any level of complexity we need. On top of the inference engines we find the rule based system. Of course those are parallelizable too (Petcu, 2006). These systems are based on complex groups of rules – metarules - used to handle the execution of other rules.

The fact the systems are parallelizable opens the possibility of creating another form of distributed artificial intelligence. The term usually refers to a complex system of intelligent agents deployed onto a distributed system. It is not clear why the generic term artificial intelligence that nowadays covers all the specific branches was selected to define only the intelligent agents application in distributed computing. Usually the accepted term is distributed expert systems.

A first possible application probably will be the universal translator. Actual level of knowledge offer as a possible solution a combination between an immense database like e.g.

Google and a very powerful expert system. The speech therapy has also benefitted from using expert systems. There are researches that prove the efficiency of a Fuzzy Expert System in handling home treatment of the patient (Schipor et al., 2008). Various techniques from AI are used in psychiatry. For example, in diagnosis of dyslexia a combination of fuzzy and genetic algorithms proves to correctly manage a diagnostic using low quality input data (Palacios et al., 2010).
The system can use the patient voice itself as supplementary information in making a good anamnesis. Important results have already been obtained in making some assumptions about voice pathology, results such as the Massachusetts Eye & Ear Infirmary (MEEI) Voice Disorders Database (Saenz-Lechon et al., 2006). The results of these studies cannot be used separately because there are too many different causes that can drive to the same behaviour to a patient voice (Paulraj et al., 2009). Yet, its use in conjunction with other measurements can provide valuable information about the patient.

4. Social Information retrieval system

The researchers in social sciences or psychology need to readapt to the cyberspace realities. As a result, new ways of gathering data about people or communities must be developed. There are possibilities of handling information retrieval from Internet. There are many stages in extracting knowledge from digital documents, or from social networks. In the beginning, a search engine needs to be implemented because the expert will set some temporary or long term areas of interest, usually referred by the use of a keyword set. One possibility is to fully develop the search engine from scratch. This approach is very costly in terms of project resources, but it has the advantage of having a fine tune around the problem specification. This approach is recommended especially when the search is made in well defined large databases with controlled access; otherwise, the use of available global search engines dynamic libraries can easily handle the problem. The most important search engines are Google, Yahoo or Bing. The commercial approach of Google prohibits the use of their libraries in that scope, but the Microsoft Bing alternative can be used without any problems.
In human to human communication, there are a lot of difficulties regarding the typical ambiguities of natural language or cultural differences. As a result, the main problem of searching involves the minimization of informational redundancy. Worst than that, usually a search process involves a set of words from the user knowledge and there are good chances that his dictionary has only a partial match to the ones of other authors who have written some information that is really needed by that user. In the case of psychology, we have a big problem because many schools have the same universe of discourse (over 50% match), but unfortunately they use different discourse universes, and sometimes even different standard notations. This makes it very difficult to apply an information retrieval system to efficient filter the news appear in the domain. As a result, an efficient dedicated retrieval system for a psychologist will need to be continuously tuned with the researcher in order to quickly adapt. This approach can drive maybe, in time, the system to gather enough rules to decrease gradually the supplementary input demands from the expert. In order to process all the problems regarding different representations of the same knowledge, an expert system can be used. The Internet has more information about an individual than one can expect. That is due to the continuous increasing dependence of the human to the IT related tools.

There are parts of the social life that begin to be partially or fully virtualized. Within this process, a lot of information about a person is given. The information can be classified in two categories:

- Explicit: required by the social network so the user is aware about the content and can judge the implication of making them partially or fully public;
- Implicit: in that case the information is given also by interaction with all the friends from his local social network? In many situations the user is not aware about the nature and some time the confidentiality of the information provided because (s)he makes no difference between virtual world and direct contact with the group members.

So the social networks can provide a lot of information about a person or a group of people. The information is stored in virtual space so an interface with the social network must be developed. There is not problem of accessing private information about the people without their consent because in this system the information can be shared only if the person involved gives his explicit permission to do that. The proposed system will have two components: one is the HCI based interface created using intelligent agents, and the other is the system for information retrieval.

4.1 System HCI

There are various approaches that use HCI techniques and expert systems that try to make the computer appear more "friendly" to the user. The increased emotional intelligence abilities of some humans give them many direct or indirect advantages over others without making too many investments. Therefore, the experts begin to study ways of making computers capable of emulating this kind of abilities.

Klein proposes to make computers emulate emotional intelligence. In fact, he studies the ways of giving the system the possibility to handle the user frustration which is sometimes justified, and sometimes not. Moreover, he proves that the computer can handle the negative emotions of the user in order to partially or totally dissipate them (Klein, 1999). This is a very important result because the user productivity is heavily affected by strong negative emotions and the future of the society involves more and more the use of the computer in every domain of activity.

It may be usefully for the proposed system if we use the research results regarding facial expression classification and interpretation (Cohn & Sayette, 2010). There are similar researches in terms of multimodal emotion recognition. The results seem to be promising and already the cultural differences in emotion handling are being analyzed (Banziger, 2009).

The natural language analysis is very complicated from IT point of view. Even the psychologist has many discussions regarding informational redundancy that may increase even at the level of same culture with large geographical coverage. As result both parts begin to make interdisciplinary researches in the field of text analysis. The psychologists begin to investigate how the text content should be analyzed from their point of view. As result the chances of extracting the original idea of the speaker are increased. For example, some researchers try to identify a subset of Freudian drives in patient and therapist discourse text analysis of a classic interview (Saggion et al., 2010).

As we have seen until now, there is a constant and high interest from both the psychologists and IT specialists in developing more and more complex, but effective, ways to deal with the user in a more natural manner. Until now, we have analyzed separate experiments that

try to solve different aspects of the complex relation that appears when two people interact, and to replicate it at the computer system level as good as possible. Because of so many differences between the relevant aspects, a more natural way in handling all of them into a single software system will be to use intelligent agents. Intelligent agents represent static or mobile pieces of programs with various levels of complexity.

Intelligent agents also have some specific AI algorithms integrated. Their development seems to be in close relationship with distributed systems. The agents usually need a special framework to be loaded on each involved machine. The development of industrial applications is slow because of security related problems. No one can guaranty yet that a piece of code executed into the framework cannot be harmful for the host. That's why service oriented architecture begins to gain interest. Anyhow, the intelligent agents have an immense potential both from the theory and the practice point of view. There are various classifications of intelligent agents, but from the implementation point of view, the distinction between week and strong agents seems to be more useful (Wooldrige et al., 1995). The weak agents have the following properties:

- Proactive - when agents can initiate behaviours and courses of action in order to reach their objectives.
- Reactive: agents can answer to external events.
- Autonomous: agents don't need human interaction.
- Social: agents can communicate with other agents using an agreed Agent Communication Language (ACL) and ontology (e.g. KQML for intelligent agents).

Strong agents will inherit the characteristics of weak agents, but enrich them with the following characteristics:

- Rationality: an agent will take no action in such a way that would contradict its objectives.
- Benevolence: agents should not act in such as way that would compromise other agent or its host environment.
- Veracity: agents are truthful.

For our HCI we need to use strong agents. We propose to use the Bickmore approach as a starting base in designing HCI interface. He developed a system based on a combination between intelligent agents and advanced HCI techniques in order to acquire the best possible personal relationship between the human and the computer (Bickmore, 2003). From all types presented, we choose to use the following type of agents:

- Social agents are defined as those artefacts, primarily computational, that are intentionally designed to display social cues or otherwise to produce a social response in the person using them (Bickmore, 2003). Their introduction is based on various studies that prove that people change their behaviour and evaluation of the relation with an animated virtual reality character which can emulate some social interaction abilities.
- Affective agents are those intentionally designed to display affect, recognize affect in users, or manipulate the user's affective state (Bickmore, 2003). They have abilities in the emotional intelligence field. They most control various levels of verbal and nonverbal communication normally used by a person. Here we can mention the facial expression, the body posture, the colour of skin response, the use of grips, the use of natural voice and synchronized the emulated mood with the voice tone. One of the problems is the detection of user mood. This can be done using various pattern recognition tools (for speech, face recognition, voice recognition and analysis, posture and skin colour) and then to use the same knowledge database as the emulated person.

- Embodied Conversational Agents are animated humanoid software agents that use speech, gaze, gesture, intonation and other nonverbal modalities to emulate the experience of human face-to-face conversation with their users (Bickmore, 2003). They are also constructed on top of the affective agents and create a 3D virtual humanoid to increase the efficiency of user interaction.

The following type of agents are also required to assure a proper functionality:

- GUI agents that represent the classical GUI used to communicate with any desired type of application. This approach can be used due to the use of Model View Controller approach in application design.
- The Information retrieval client agent. This will assure the direct communication with the second component of the application.

Regarding the high precision control of the expression for the HCI agent, the research results of MIT (Bickmore, 2003) can be improved if a hierarchical composition model is used. The agent can be seen as an independent service world wide available if an approach based on human to markup language will be used. This approach is based on fuzzy markup language and is used to construct ambient intelligence architecture (Acampora et al., 2007).

If we analyze the existing comparison matrix from various agent frameworks (WIKI, 2011), we see that is a small number fully compatible with FIPA (Foundation for Intelligent Physical Agents):

- ADK (Tryllian Agent Development Kit) was designed for large scale distributed applications; Mobile (distributed) agents.
- JADE was designed for distributed applications composed of autonomous entities.
- SeSAm (Shell for Simulated Agent Systems) (fully integrated graphical simulation environment) was designed for General purpose multi domain (agent based); research, teaching, resources, graph theory that poses a plug-in for FIPA.
- ZEUS was designed for distributed multi-agent simulations.

The last two offer only simulation possibilities, so they are unfeasible for implementation. From ADK and Jade we will choose JADE because they offer support not only on Java, but also for Microsoft .Net and that gives us the liberty of choosing the best fitted technology to develop the system.

4.2 Information retrieval system

An Information Retrieval System – IRS is usually composed from four layers (Kowalski, 2011):

- Data gathering – here the information is retrieved from Internet or local networks in accord with the rules set by the user. Sometimes it is used the solution of distributed search using autonomous entities that will push the filtered information to the central data base. The data normalization process and some pre-indexing algorithms are also executed in this case.
- Indexing – here the creation of quick searchable database is the main concern. There are different approaches to create an indexing system (based by Boolean, by weight and by statistic) but the differences between them begin to be relevant only for a very large collection of data. As a result, a classical database management system (DBMS) is mostly used to store data.
- Searching – the methods used can vary from using the implicit DBMS operators to use custom set of operations sometime based on AI.

- Presentation – here the graphical user interface used in data graphical representation is designed. The methods like clustering if so are also elected.

In the figure 1, the structure of proposed IRS is presented.

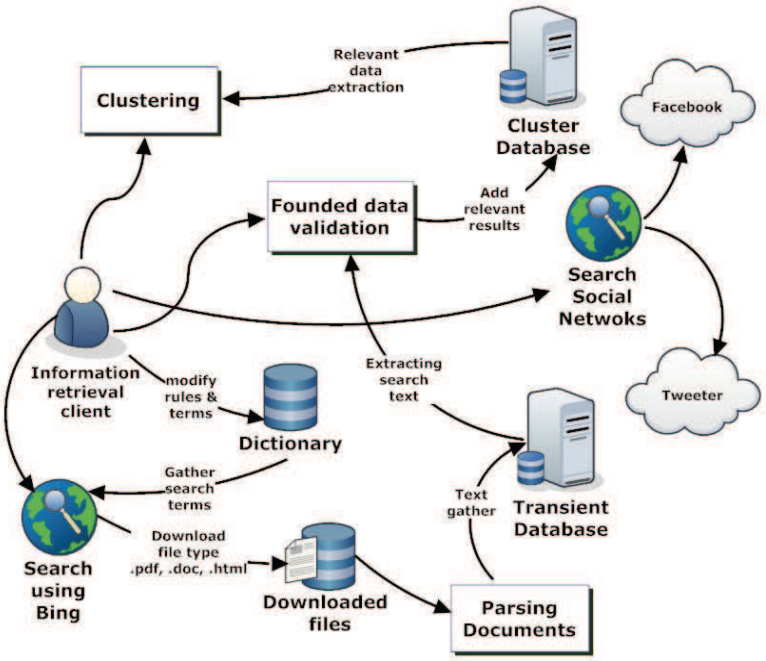

Fig. 1. The proposed IRS system structure

The IRS will have the ability not only to retrieve documents from the Internet, but also to make text analyses in order to find exactly the needed pieces of the information. Supported type of files are portable document format, word and html files. To do that the expert will give the rules, than those rules will be executed by an expert system.

The use of the expert system in the context is similar to the one used in DIRT (Lin & Pantel, 2001), but with supervised control of the rules in conjunction with the ideas specific to the RUBIC system (Mc Cune et al., 1985). So, the expert system is used to make a better selection from an already gathered set of documents, or paragraphs from documents. The rules are established by the IT expert together with the psychology expert.

The IRS can also retrieve information from social networks. The only requirement needed to do that is that all the people involved must have added as a friend the expert.

API Bing can be accessed using various protocols like JSON, SOAP and XML in order to have access to search results.

JSON is ideal to interface with AJAX applications and it is specific in the designing of web applications. SOAP and XML can exchange data with desktop, server or even WEB related applications. The SOAP is specific to the high level layer, where the ability of parsing the request and the answers is required. XML is more general because the request is http type and the answer is in XML format. As a result, the XML was selected to be used in establishing making connection with Bing API.

In order to assure social network access, a connector for Facebook and Twitter was developed (Czeran, 2011). The connection to Facebook social network implies the ability of automatic logging in the network.

In order to solve the problem, the protocol OAuth 2.0 was analyzed. This is an open standard that allows the user to share their private resources stored on the site without needing to provide their credentials (like user and password). Instead of that, the protocol gives the possibility that a user provide tokens. Each token will give access only to a resource or area from the site. As a result, an automatic connector must be created as a Facebook application that will be deployed on the Facebook developers site. This application will provide a pair (AppID, AppSecret) used in OAuth authentication phase. Because the access tokens have limited life time and limited access to resources, analyzing a social graph with large number of nodes (on the higher levels of the associated tree) is not possible yet. Anyhow, the information retrieval begins after the logging into the network and uses the Graph API service. The answer given by this service is serialized JSON (JavaScript Object Notation) objects. This is a standard used for human readable data exchange and it is language independent. To deserialise the answer the JSON .NET was used.

The api.twitter.com was used to access the micro-blog service Twitter data collection. The full history for a user can be retrieved if it is not protected and does not overcame 3200 recordings. The information is given in ATOM - that is a XML based format used in web dataflow.

To create a connector with the Facebook and Twitter a dedicated library named collection factory was used. Its main components are class package FacebookUtil and a separate class oAuthFacebook.

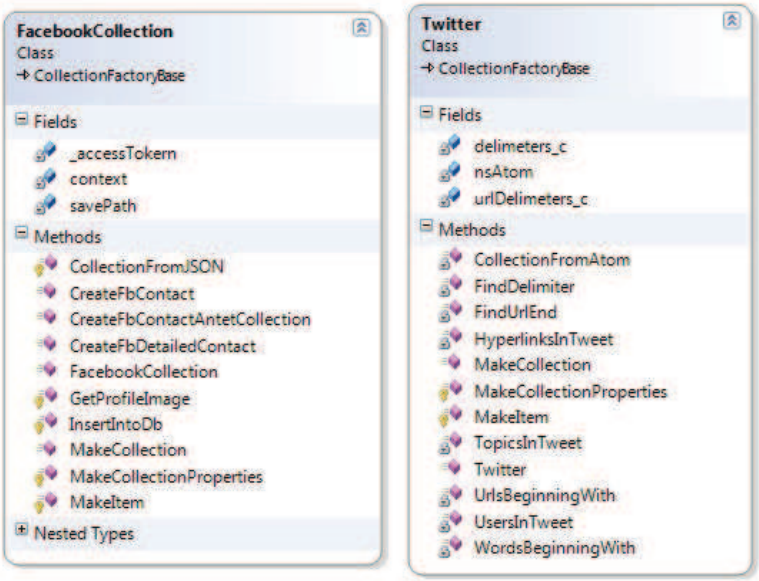

Fig. 2. The main classes used for connection with Facebook and Twitter

The FacebookUtil has utility classes that deserialise the JSON flows coming from Graph API service, and generate the object with relevant information. The base needed for oAuth protocol is also created in this case. The oAuthFacebook works at a higher level.
It takes the parameters given by Facebook type application registration (AppId, AppSecret) and then receives the authorization token to begin data retrieval.
The FacebookCollection (see figure 2) class encapsulate the methods used to retrieve data from Graph API service and MakeCollection method that will generate the data object from retrieved data. The data persistence is assured by the use of InsertIntoDb that writes it into a temporary database. The same approach was used in the design of the Twitter class where the methods used to access the service Twitter API, to parse the retrieved information in the ATOM format are encompassed.

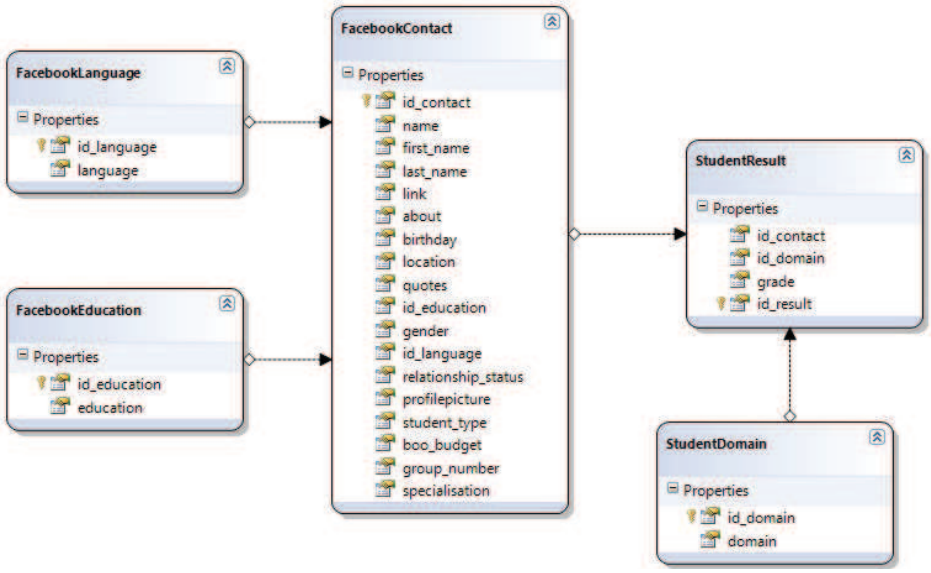

Fig. 3. Data base structure for retrieved social network information persistence

As a supplementary feature, there is the possibility of processing any information posted separately on Twitter. This facilitates the process of information classification by obtaining quantifying characteristics that can be translated into categories using Facet objects. The method TopicsInTweet will count the number of themes from the current post and the UsersInTweet method counts the number of references to a specific user in all posting collection.
In figure 3 we present the part of temporary database that stores some information gathered form the social network. In this case, the gathered information was about a group of students using the social network.
The interface agent has access on the main functions of the IRS. Those are search term control and modification using if necessary supplementary keys and rules, automatic validation of results and clustering module. The action of interface agent is presented in figure 4 as a case diagram.

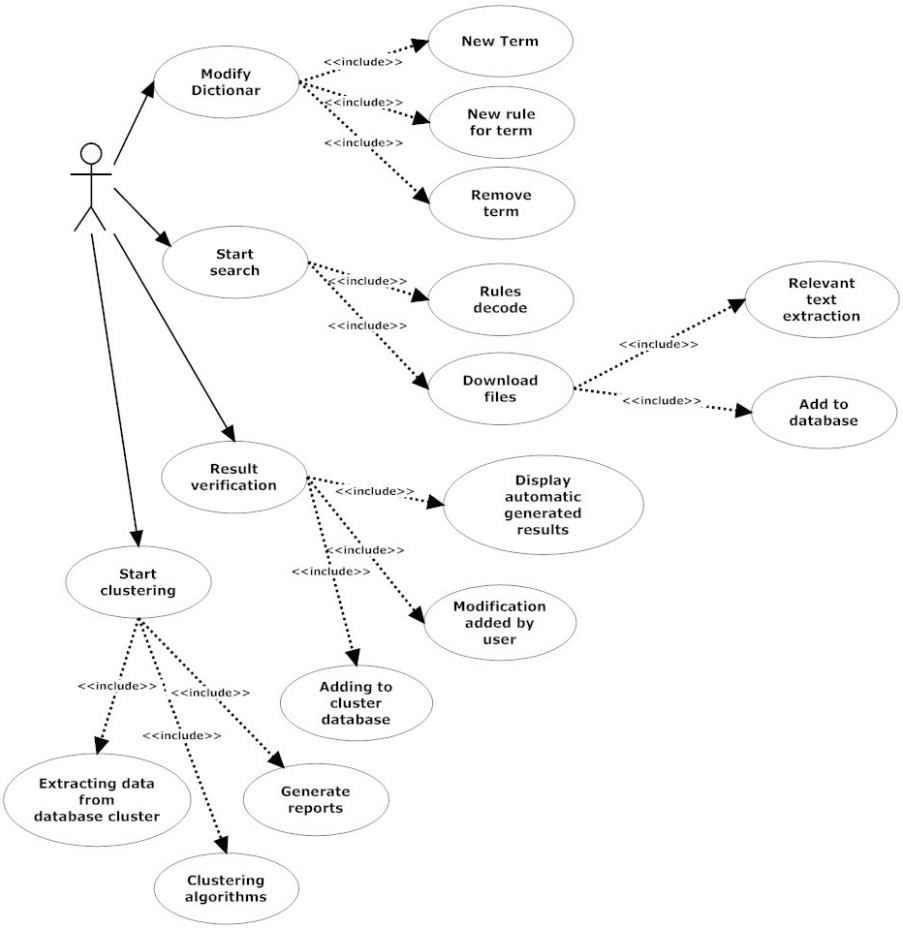

Fig. 4. IRS user use case diagram

The IRS has some separate modules: for interfacing with interface agent, for downloading selected files, for analyzing files content, the module for creating dictionary and rule execution, a database with two parts: one for files, and one for relevant part of text extraction, and finally the clustering module.

In figure 5, an activities diagram presents the way in which each module will interact with each other. The term dictionary module will process the files that contain search terms and use a sub-module used to generate new types of rules. These rules are parsed further to generate the ranking for search terms.

The file used to store dictionary data is XML type and has the following minimal information: search term, works or key notations associated with the search terms, rules and expressions. Also here the document is parsed using rules, terms and afferent keys.

The file downloader or reader module uses the Bing, Facebook and Twitter connectors to search and download the needed files.

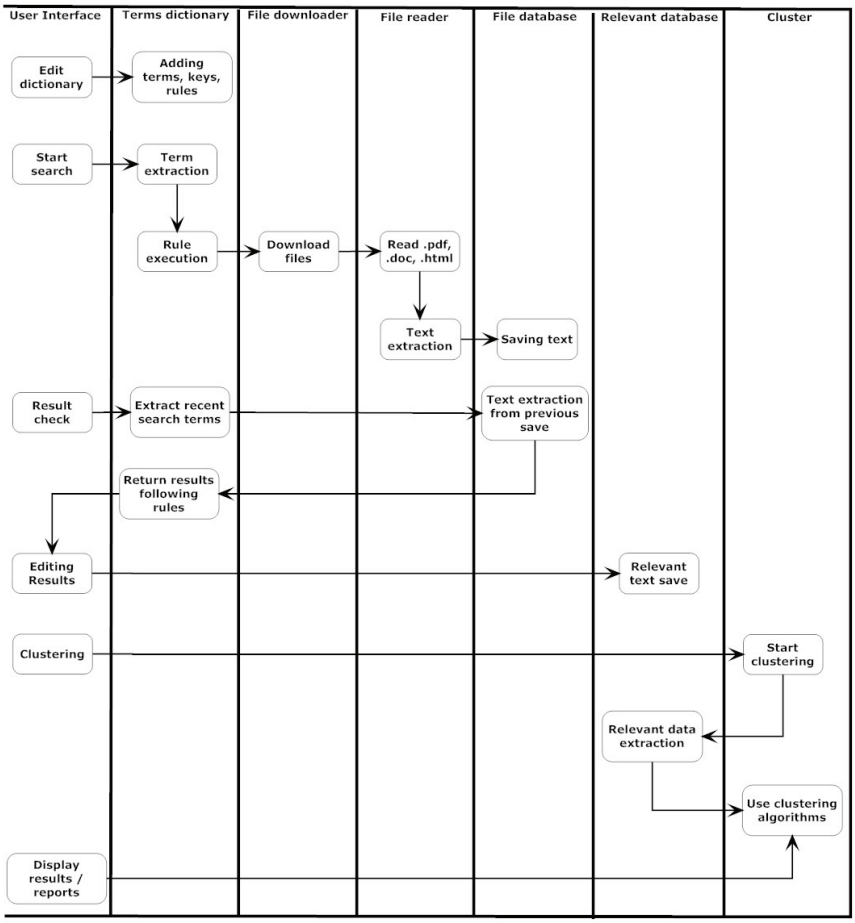

Fig. 5. IRS activities diagram

To download .NET WebRequest methods are used and than they are saved on the temporary data base. After that, the files are sent to text extraction using specific parser for each supported type. When the text is extracted, the structure of initial document is kept as a set of relations from figures, tables and text.

5. Conclusions

In this chapter a short surveillance of IT applications in psychology and psychiatry has been presented. The use of IT in psychology and psychiatry is common nowadays. As a result, more and more interdisciplinary research is conducted. The concept of cyberpsychology is yet vague because it tries to cover this interdisciplinary research, but the potential is unlimited due to the speed of technology development.

The proposed system is intended to increase the abilities of the expert by improving the possibility of finding information about their area of interest and research on the net. Also

this solution gives the possibility to gather some data about social groups using new unconventional methods.
The use of AI will also improve the communication methods in conjunction with HCI specific techniques.
There is a lot research to be done in order to finish the full implementation of the system, but the first results are encouraging.

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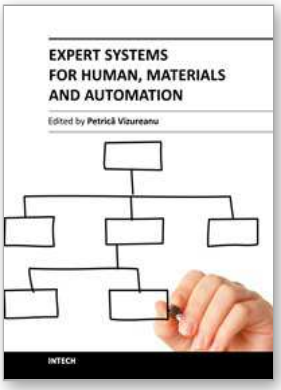

Expert Systems for Human, Materials and Automation

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The ability to create intelligent machines has intrigued humans since ancient times, and today with the advent of the computer and 50 years of research into AI programming techniques, the dream of smart machines is becoming a reality. The concept of human-computer interfaces has been undergoing changes over the years. In carrying out the most important tasks is the lack of formalized application methods, mathematical models and advanced computer support. The evolution of biological systems to adapt to their environment has fascinated and challenged scientists to increase their level of understanding of the functional characteristics of such systems. This book has 19 chapters and explain that the expert systems are products of the artificial intelligence, branch of computer science that seeks to develop intelligent programs for human, materials and automation.

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