Malaysian Journal of Computing, 5 (2): 619-634, 2020

eISSN: 2600-8238 online

INTERACTIVE STORY GRAPH STRUCTURE FOR DIGITAL STORYTELLING

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ABSTRACT

The flow of a storyline should be structured well and organized to make it understandable and complete. The most enticing and fascinating storytelling nowadays is digital storytelling, as all the information and entertainment move into digital devices. To make digital storytelling more interactive and attractive, some interactive features, such as interactivity, iteration, and multi-option incorporated in the story structure. Nevertheless, the interactive features should be explained well in the story structure to ease the process of interpreting the interactive storyline. However, the existing story structure could not support those features. Therefore, the creation of a new story structure will help the process of interpreting an interactive storyline with those interactive features. In this paper, a new story structure known as Interactive Story Graph Structure (ISGS) *that blends well with the interactive features by modifying the existing story structure approach is proposed. The flow of a storyline using the proposed story structure can be created by applying a few new symbols that match the storyline by following the guidelines of making a new story structure. The new story structure has been evaluated by ten experts that have looked at the acceptance and usability of the new story structure as part of the process to interpret the interactive storyline for digital storytelling. The results of the evaluation had achieved a value of 88.89% by analyzing the data from descriptive analysis and bar charts. This study suggests the ISGS add more interactive features to produce interactive digital storytelling with the various flow of story structures embedded with more features provided.*

Keywords*: Digital storytelling, Interactive storyline, Story graph, Story structure.*

Received for review: 12-08-2020; Accepted: 30-09-2020; Published: 28-10-2020

1. Introduction

Storytelling is a great potential form of graphics and communication as a teaching-learning tool (Yahya & Baki, 2018). It has a clear description through stories or narratives that elicit powerful emotions and observations of concepts, values, personal experiences and life-lessons (Serrat, 2017). That is why storytelling is used for communicating and capitalizing on individual experiences in stories and narratives. There are four types of storytelling which are visual storytelling, video storytelling, oral storytelling, and digital storytelling. Visual storytelling uses a picture by portraying a story behind it, whereas video storytelling is often creating a short video of the story, in which to market the product to gain and attract the customer, rather than simply displaying a product. On the other hand, oral storytelling is a tale that an individual

personally conveys. So, the narrator will use different voices and puppets to attract the audience while, digital storytelling is a combination of visual, video, and oral storytelling.

Digital storytelling is a combination art of telling stories with various types of digital multimedia, such as images, audio, animation, text, and video (O'Byrne *et al.*, 2018). It works to create interactive and attractive storytelling with education and knowledgeable content while playing along with the storytelling. In the field of education, with the current generation who are exposed well to the digital era, the storytelling should be more interactive and attractive, especially for children in order to keep their interest in learning. Interactive storytelling can be performed well by using digital storytelling. That is why digital storytelling is a popular pedagogical tool to teach students of all ages, education levels, and ethnic origins (Karakoyun, & Yapici, 2016). The teachers who use digital storytelling may find it a helpful way to interact with their students as it also helps to make abstract or conceptual content more understandable (Choo *et al.*, 2020). Moreover, the children will be encouraged to pay attention and feel fun playing games while learning (Mahazir *et al.*, 2019).

Besides, the techniques for the process of creating the story structure are the key factor in getting the best outcome for the final product. However, most-storytelling techniques used a linear narrative, concentric narrative, fishbone narrative, branching narrative, parallel narrative, and threaded narrative (Parise, 2002). By adding options for users to have two or more storylines in one story and being able to click, drag, and drop the object in the digital storytelling will make the digital storytelling more interesting, in which the existing story structure has failed to do so.

The story graph is the nodes of a directed graph that represent the users' options by connecting the arcs. The users' sense of control over the story development has limited by the number of arcs in a particular path in the branching story graph (Riedl & Young, 2008). The story graph approach can allow cycles to enable users to experience the repetition of an event. The cycles are restricted if the duration is limited. Moreover, it defines the space of progression of the legal story and eventually manages future events (Li *et al.*, 2013). Hereby, it is supporting on adding more storylines in one story that opposite to linear narrative. Using the story graph approach enables those interactive features to be achieved by making some enhancements to the branching story graph to support interactive features of interactivity, iteration, and multi-option.

Therefore, the story graph has been chosen as an approach to create a new story structure especially taking the specialty part in the story graph that allows for repetition, selection, and it has a flexible structured (non-linear narrative). Hence, the interactive features have covered more from the story graph instead of other types of existing story structures. This approach was helped to create a new story structure that has three interactive features namely, interactivity, iteration, and multi-option features, and able to produce digital storytelling with an interactive storyline.

2. Background Study

2.1 Comparison of Story Structures

The existing story structures are defined in small scopes that are divided into three categories in which story structure, types of the narrative structure of interactivity documentary, and story graph. The comparison is based on the types of narrative features that covers in this study which are iteration, interactivity, and multi-option. Table 1 shows the two interactive features that is focused in this study, namely, iteration and multi-option which are also found in the concentric narrative, fishbone narrative, and story graph. In addition, the concentric narrative and fishbone narrative are not moving in a flexible structure. This means that the narrative is designed into a

specific flow on how the narrative should be. However, the story graph can be flexible depending on how the author wants the storyline to be created without the limitation of the flow of the story structure.

Table 1. The Comparison of Existing Story Structures

Story structures	Moving in a flexible structure	Flashback and repetition (Iteration)	Interactivity	Multi-option
Linear branching	×	×	×	×
Simple branching	×	×	×	×
Diamond branching	×	×	×	×
Non-linear branching	√	√	×	×
Circular branching	×	√	×	×
Linear narrative	×	×	×	×
Concentric narrative	×	√	×	√
Fishbone narrative	×	√	×	√
Branching narrative	×	×	×	√
Parallel narrative	×	×	×	√
Threaded narrative	×	×	×	√
Story Graph	√	√	×	√

The comparison of story structures shows that the story graph has more interactive features than other story structures. The creation of a new story structure covers the interactivity part that does not cover by the story graph. Thus, the story graph approach is used for the creation of a new story structure as the story graph is the only story structure that is accessible to interpret interactive features very well.

2.2 New Story Structure

Multi-option feature is a selection that provides two or more options in a specific part of the storyline, such as at the climax part and ending part that lets users be able to see different outcomes of storylines upon clicking one of the options provided in the digital storytelling application. This feature is suitable for a story with two or more endings. The exciting part is users can get to play more than once to see several storylines from the same story. Another feature is interactivity, in which users get to play along with the characters to help the situation by clicking, dragging, and dropping objects. The users will have the feeling that they are the characters in the story by performing some actions. These features were motivated by famous interactive storytelling which is Choose Your Own Adventure book series. The players navigate a plot graph by making decisions at branching points in the story. (Edward *et al.*, 2020). Thus, this is the way for interactivity by clicking the decision to proceed with the journey of storytelling.

By using a story graph approach that enables iteration feature in the story structure, that allows users to have a sense of control over the story development, in which they are able to make a repetition path to replay an event of a story. This is the difference between the interactive and other approaches in digital production, which allows users to operate in a way that can alter the ending of the storyline (Riedl & Bulitko, 2012). Due to the limitation of using the story graph alone to interpret the interactive storyline, incorporating the features of

interactivity, iteration, and multi-option are the main contributions in enhancing the story structure by using the story graph approach.

3. Interactive Story Graph Structure

A new story structure called Interactive Story Graph Structure (ISGS) is developed to make it easier to interpret the interactive storyline that consists of those features. The ISGS is suitable for a storyline with two or more selection choices provided at the climax part and ending part in one story. Then, the flow of the story structure can be created easily by depending on how many selection choices and the storyline itself.

3.1 Description of Symbols Used

The ISGS consists of nine symbols. The basic symbols are the start, scene, multi-option, story node, and end symbol. Whereas the symbols of interaction node, repetition of a single part, repetition of full part, and repetition part are optional for the developer and designer to use as it depends on the flow of the storyline. Table 2 describes the functions and total usage of each symbol.

Table 2. The Description of Symbols

Symbol	Name	Functions	Total Usage
	Start	Represents the starting of a story	1
	Scene	Represents a new scene	>=1
	Multi-option node	Represents options for users to choose either positive or negative actions	>=2
	Interaction node	Story node with interaction part, such as drag, drop and click in the animation	>=0
	Story node	Story node without interaction part in the animation	>=1
	Repetition of a single part	Represents a repetition of a single part in one scene	>=0
	Repetition of full part	Represents a repetition of the full part in one scene	>=0
	Repetition part	Indicates as a repetition part or area for RS and RF	>=0
	End	Represents the end of a story	1

The start and end symbols are the only symbols that can be used once, while the scene and story node are the symbols that can be used once or more, while the multi-option node symbol can be used twice or more. Other symbols have the options of zero or more uses. The followings are some guidelines and rules of using the symbols:

a) The “Start” and “End” symbols are the basic part to form the ISGS as a start and end of the structure.
b) In between the “Start and “End” symbols, the ISGS allows “Scene” and “Story node” to be used once or more, depending on the storyline. The “Story node” and “Interaction node” are symbols indicating the storyline of a story. If the storyline consists of

interactivity with users, then the "Story node" symbol can be changed to the "Interaction node" symbol.

c) The "Multi-option node" symbol provides options of different outcomes in a storyline. Figure 1 shows an example of the "Multi-option node" that consists of two options.

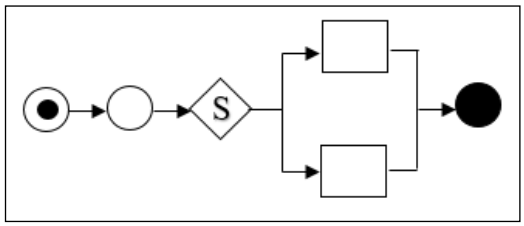

Figure 1. The multi-option (with two options)

d) The options usually in positive and negative actions, but it can be otherwise. After the multi-option node, the flow continues with the story node or interaction node. The multi-option node symbol in a scene should be connected by using an arrow, to the first multi-option node of the same scene, as shown in Figure 2. It will be the same way for the subsequent multi-option nodes of the same scene. As for the last scene, the arrow for the multi-option node should connect to the start symbol.

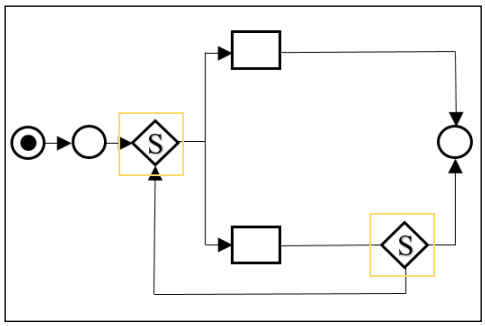

Figure 2. The multi-option node

e) The "RS" symbol can be used to duplicate a single part of a scene, identified using dashed lines (Repetition part).

f) The "RF" symbol can be used to duplicate a full part of a scene, identified using dashed lines (Repetition part).

3.2 Formation of ISGS

The formation of ISGS is being considered, especially for the interactive storyline with interactivity, iteration, and multi-option features. The designer and developer are allowed to form an ISGS with two or more scenes as they are able to use RS and RF symbols to duplicate certain parts of the scene. It is important for the ISGS to start with the start symbol and continue with any other symbols, depending on their intention when designing the flow of the storyline, then to end the story structure with the end symbol. Figure 3 illustrates the ISGS with two options and two scenes.

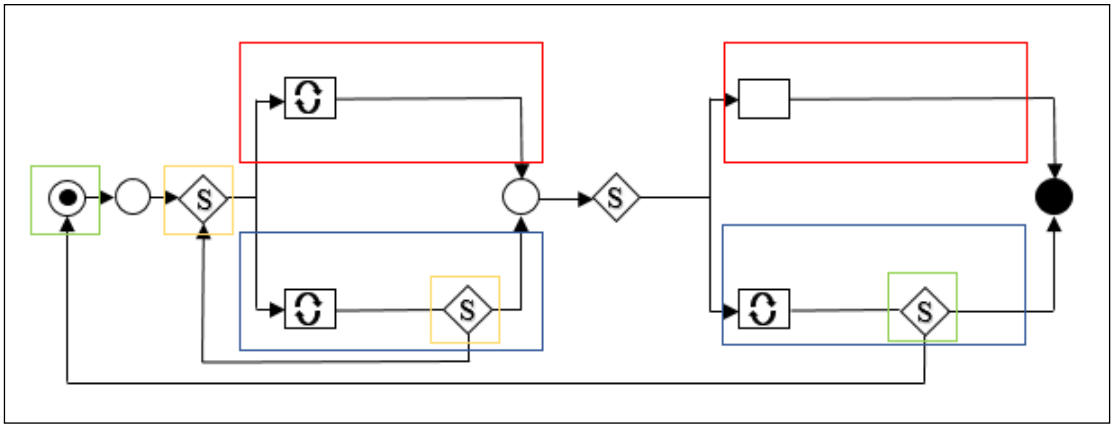

Figure 3. The ISGS 1 (with 2 options, 2 scenes)

Figure 3 consists of two scenes, in which both scenes contain two options that are shown by the use of a multi-option node symbol. The first scene continues with the first multi-option node; the example shows the scene has both positive and negative options, in which the positive and negative options are shown by the red box and blue box, respectively. Both options contain a different storyline that consists of interactivity as each of them uses the interaction node symbol. For the negative option, users can either proceed to the next scene or return to the first multi-option node. As stated in the guideline, the multi-option node should be connected to the first multi-option node of the same scene, as shown in a yellow box.

The second scene has the same flow as the first scene in which the scene contains two options. However, only the negative option (represented by the blue box) has another multi-option node. In this example, the second scene considers as the final scene thus, the next multi-option node should connect to the start symbol as shown in the green box to indicate that the story to replay from the very beginning.

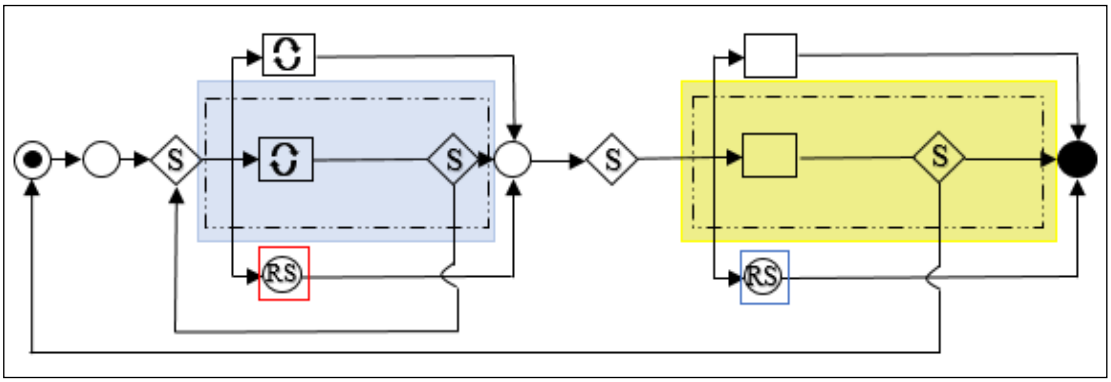

Figure 4. The ISGS (with 3 options, 2 scenes)

Figure 4 illustrates an example of ISGS with two scenes and three options. After the first scene, the flow proceeds to the multi-option node that provides three options. It is similar to the example illustrated in Figure 3, in which the first option represents a positive option (red box), and the second option represents a negative option (blue box). However, in this example, a third option that represents a neutral option that is not shown in the red box and blue box from the previous figure. Both negative and positive options provide with another option, in which the

guideline indicated that the arrow should connect to the first multi-option node, otherwise proceed to the next scene. The RS symbol in the first option indicates the same flow as in the second option. A flow in a single part of the same scene can duplicate by using dashed lines, as shown in the blue box. The second scene also proceeds to a multi-option node with three options. To duplicate a single part of the second option in the second scene, dashed lines are used again, as shown in the yellow box, indicating a repetition part for the RS in the negative option of the second scene. As stated in the guideline, the RS symbol can only duplicate the flow of a single part in the same scene.

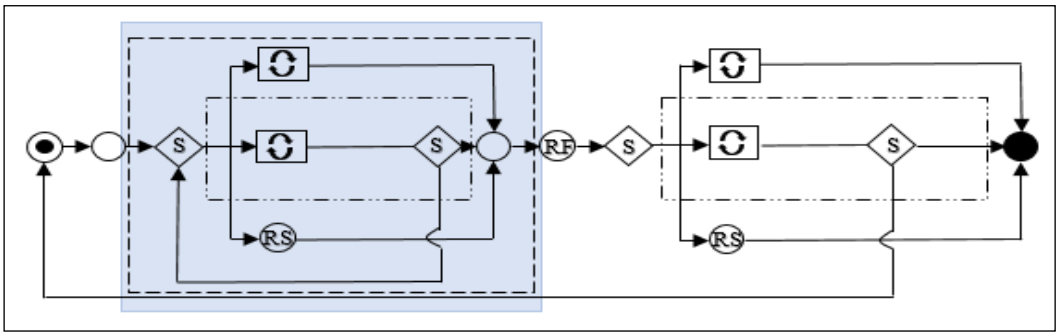

Figure 5. The ISGS 3 (with 3 options, 3 scenes)

There will be slightly different in duplicating the whole scene. Figure 5 illustrates the first scene with three options. The second scene also contains the same flow as the first scene. In order to duplicate the whole scene in the first scene, then the RF symbol is used to indicate the second scene with the whole same flow as the first scene. This can achieve by using a dashed line, as shown in the blue box. Then, the flow proceeds to the last scene, which also contains three options. As mentioned earlier, the multi-option node in the last scene should connect to the start symbol to indicate that the story to replay from the very beginning, and at the same time, another option should connect to the end symbol.

3.3 Examples of ISGS

Figure 6 illustrates the ISGS that has four options and three scenes and at the same time, consists of the same flow of a single part and a whole scene.

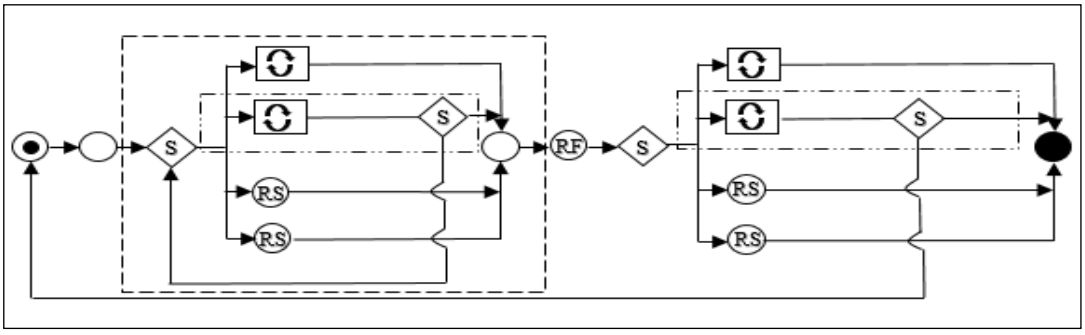

Figure 6. The ISGS 4 (with 4 options, 3 scenes)

The RS symbol in the third and fourth options of the first scene indicate the same flow within the dashed lines of the second option. While for the third scene or also considered as the final scene, the RS symbol in the third and fourth options indicates the same flow within the dashed lines of the second option.

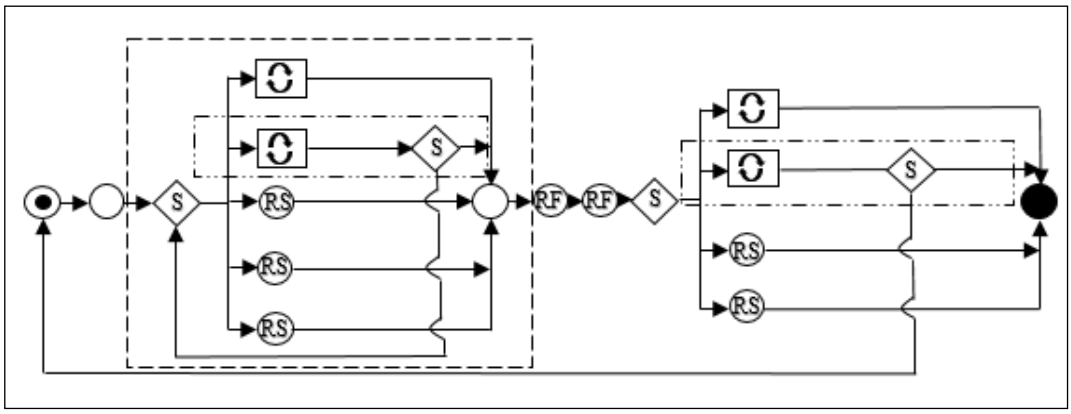

Figure 7. The ISGS 5 (with 5 options & 4 options, 4 scenes)

Besides, the RF symbol represents the duplication flow of the whole first scene, indicated by dashed lines. The RF symbol has the same function as the RS symbol, indicating a repetition part as the RF is a duplicate of the whole scene while the RS is duplicate only one part in a scene. Figure 7 illustrates an example of four scenes with five options. The example shows that the second and third scenes consist of the same flow of the first scene. This is represented by the RF symbol to indicate the repetition of the whole first scene. In other words, the first, second and third scenes have the same flow as illustrated for the first scene. However, the fourth or the final scene has only four options and the second multi-option node in this scene should be connected to the start symbol and to have another path that proceeds to the end symbol, which the connected arrow could not be the same as previous scenes. If the function of RS and RF symbols does not use, then the story structure will become complicated and unorganised, as shown in Figure 8.

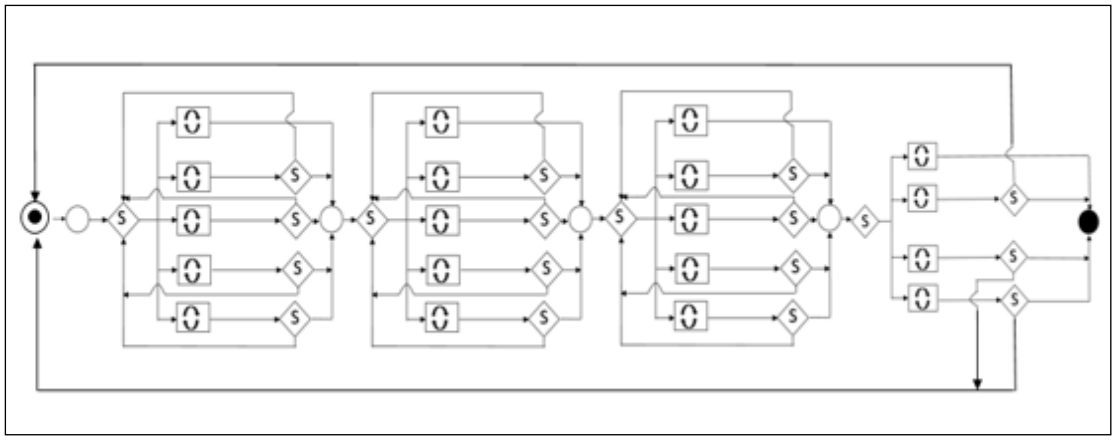

Figure 8. The actual path of story structure without repetition symbols (with 5 options & 4 options, 4 scenes)

The figure becomes more complex, which requires more space to draw the flow of the storyline and the connection to the symbols, compared to when using RS and RF symbols. The function of RS and RF symbols are useful if the story consists of more than two scenes and more than two multi-option nodes.

3.4 Advantages of ISGS

The ISGS is suitable for a storyline with more than one end. The end-user will be able to get different story paths in one story by having the option to use a multi-option node. The design of the ISGS is easy to understand and easy to interpret the flow of the interactive storyline. The symbols are customized, depending on how the designer or developer arranges them in the ISGS, as long as the multi-option node is connected correctly by adhering to the guideline in creating the ISGS. Besides, the ISGS helps to reduce time and save space when creating a flow of a storyline that has more than two scenes and more than two options.

4. Evaluation of ISGS

The evaluation has been conducted with 10 expert reviewers to give their reviews on the ISGS. The expert reviewers are developers and designers that have experiences from 5 months to 19 years with structuring the story and the flowchart by developing the system. According to Okoli and Pawlowski (2004), it is advised to take in between 10 and 18 experts (Toepoel & Emerson, 2017). They help define the deficiency and the functionality of the ISGS in the overall view. The questionnaire has been divided into four parts, which are "Features of Symbols", "Features of Structure", "Relationship between Symbols and Story Structure", and "Conclusion". In data analysis, the questions have been translated into a Likert scale, in which the opinion is express in a continuum from strongly disagree to strongly agree (Harry & Deborah, 2012). Likert scale measures 'attitude' according to scientific acceptance and validated manner.

Attitude can be characterized as a preferential way of responding to specific organizations rooted belief and ideas through social interaction (Joshi & Pal, 2015). The responses from the expert reviews were exported into data coding using Statistical Package for Social Sciences (SPSS). As the ideal number is concerned for the number of scales, the data show that from seven categories onwards gains less from a psychometric point of view than the use of between four or seven. The clear conclusion of the research is that the categories are minimum to ensure a reasonable level of reliability is four (Lozano *et al.*, 2008). As stated by Malechwanzi (2019), a point Likert scale is the optimal number of alternatives. Therefore, the questions use the 4-point Likert scale in which strongly disagree is represented by 1, disagree is by 2, agree is by 3, and strongly agree is by 4. In the first part, there were seven questions (ISGS1.1 – ISGS1.7) to measure the suitability, function and understanding of the symbols used in the ISGS, as shown in Table 3.

Table 3. Features of Symbols Part (ISGS1)

Features of Symbols	Strongly Disagree	Disagree	Agree	Strongly Agree
ISGS1.1 The designs of the symbols are suitable.	1	2	3	4
ISGS1.2 The designs of the symbols are easy to remember.	1	2	3	4
ISGS1.3 The functions of the symbols are well represented	1	2	3	4
ISGS1.4 The functions of the symbols are useful.	1	2	3	4
ISGS1.5 I understand the functions of the symbols.	1	2	3	4

ISGS1.6 I understand how to apply the symbols in the ISGS.	1	2	3	4
ISGS1.7 I think the symbols are required in the ISGS.	1	2	3	4

For the second part, Features of Structure, there were five questions (ISGS2.1 – ISGS2.5) to measure the easiness of interpreting the interactive storyline using the ISGS and to define understanding and function of the ISGS, as shown in Table 4.

Table 4. Features of Story Structure Part (ISGS2)

Features of Story Structure	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
ISGS2.1 It is easy to interpret an interactive storyline using ISGS.	1	2	3	4
ISGS2.2 I understand how the storyline path works.	1	2	3	4
ISGS2.3 The ISGS helps to create a story structure.	1	2	3	4
ISGS2.4 I know how to create the storyline path using the ISGS.	1	2	3	4
ISGS2.5 I think the storyline path is not presented well.	1	2	3	4

The third part is the relationship between the symbols and the story structure, which consists of six questions (ISGS3.1 – ISGS3.6) to measure the suitability and complementary of the symbols in the story structure as shown in Table 5.

Table 5. Relationship between Symbols and Story Structure Part (ISGS3)

Relationship between Symbols and Story Structure	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
ISGS3.1 The symbols are suitable with the story structure.	1	2	3	4
ISGS3.2 The functions of repetition symbols help the arrangement and simplify the story structure.	1	2	3	4
ISGS3.3 I know how to create paths using a multi-option node symbol in the ISGS.	1	2	3	4
ISGS3.4 I know the rule of paths using multi-option node symbol in the ISGS.	1	2	3	4
ISGS3.5 The story structure is more complicated when using the symbols.	1	2	3	4
ISGS3.6 The story structure is more complex when using the symbols	1	2	3	4

The last part is the conclusion that consists of three questions (C1 – C3) to conclude the understanding of the overall ISGS, the scope of ISGS and the suitability to implement interactive storyline using the ISGS, as shown in Table 6. The answers should be either Yes that is represented by 1, No by 2, or Not Sure by 3.

Table 6. Conclusion Part (C1-C3)

Conclusion	Yes	No	Not Sure
C1 Do you understand the overall the Interactive Story Graph Structure (ISGS)?	1	2	3
C2 Do you understand the ISGS scope (iteration, interactivity and multi-option)?	1	2	3
C3 Does the interactive storyline suitable to be implemented based on the ISGS?	1	2	3

5. Results and Discussion

The data has been gathered from 10 expert reviews that presented in terms of the frequency value, mean and standard deviation. Table 7 shows that the evaluation results from part 1 – part 3 (ISGS1.1-ISGS3.6) that combines the results of mean, standard deviation, generally disagree and generally agree that analyzed based on the Likert Scale. The questions of ISGS2.5, ISGS3.5, and ISGS3.6 have reversed questions that asked about the complexity and complicated of the ISGS. Then, the data collected from these three questions have been reversed to the positive sentence in order to get accurate results by calculating all ISGS questions. The result of generally disagree is the total values from strongly disagree (1) and disagree (2) while generally agree is the total from strongly agree (3) and agree (4). As shown in the table, all questions in the generally agree were ≥.50% with mean values also reaching to ≥3.000 except the question of ISGS3.6 that asked about the complexity of the ISGS which also got the least value among all the values in the generally agrees with 70%.

Table 7. Evaluation's Results of The ISGS Features – Summary Statistics

	Mean	Std. Deviation	Generally disagree (%)	Generally agree (%)
ISGS1.1	3.5000	.70711	10	90
ISGS1.2	3.4000	.51640	0	100
ISGS1.3	3.4000	.51640	0	100
ISGS1.4	3.5000	.52705	0	100
ISGS1.5	3.6000	.51640	0	100
ISGS1.6	3.4000	.51640	0	100
ISGS1.7	3.6000	.51640	0	100
ISGS2.1	3.4000	.51640	0	100
ISGS2.2	3.6000	.51640	0	100
ISGS2.3	3.5000	.52705	0	100
ISGS2.4	3.1000	.56765	10	90
ISGS2.5	3.3000	.48305	0	100
ISGS3.1	3.2000	.63246	10	90
ISGS3.2	3.3000	.48305	0	100
ISGS3.3	3.2000	.63246	10	90
ISGS3.4	3.3000	.67495	10	90
ISGS3.5	3.0000	.66667	20	80
ISGS3.6	2.9000	.73786	30	70
Total			**5.56**	**94.44**

Note: Generally disagree = Strongly disagree + disagree, Generally agree = Strongly agree + agree

Furthermore, as shown in Figure 9, the frequency value for ISGS3.6 obtained 3 out of 10 expert reviewers who agreed with the complexity of the ISGS. But, with the total values in percentage of generally agree still manage to get the highest value with 94.44%. While the generally disagree only 5.56% of the questions were obtained from ISGS3.5 and ISGS3.6 questions, in which gave the contribution percentage to the generally disagree about the complexity and complicated of the ISGS. Other than that, it was accepted by the expert reviewers on the understanding of the features of symbols and the features of story structure. It has concluded that most of the experts are agreed and strongly agreed with the symbols, story structure and the combination of both features into the ISGS.

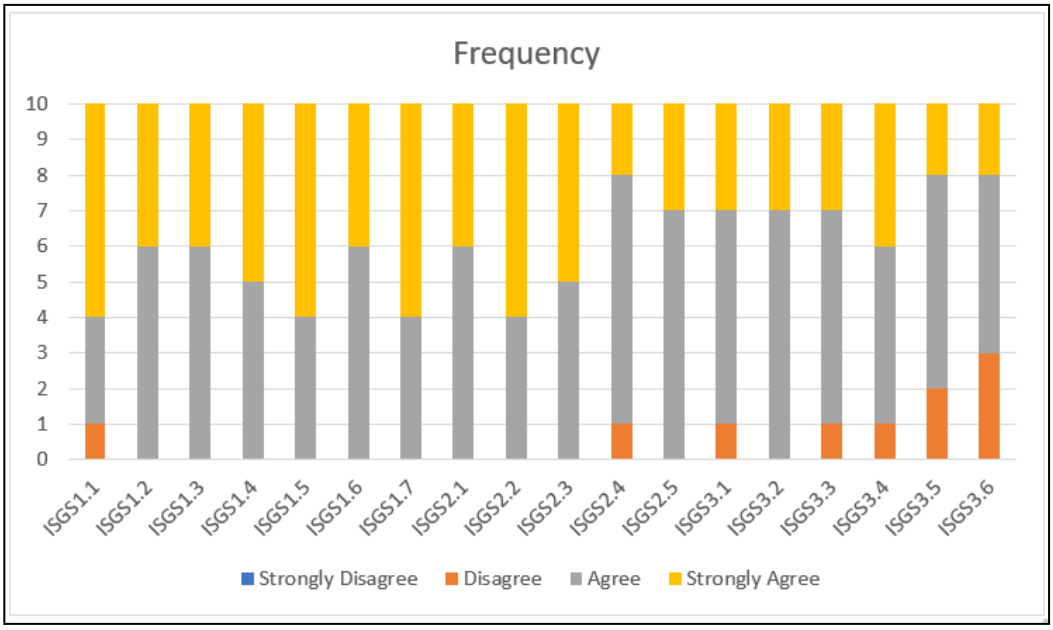

Figure 9. Frequency result (ISGS1.1 – ISGS3.6)

On the other hand, Table 8 illustrates the finding based on the ISGS conclusion as part of the overall view of the ISGS, which indicates that all expert reviewers did not answer No for all questions. Among 10 expert reviewers, there was a maximum of 2 experts who voted Not Sure for questions C1 and C2 that asked about the understanding of ISGS and the scope, while 1 expert voted Not Sure for question C3, about the suitability of implementing an interactive storyline using the ISGS that have shown the frequency value of experts in Figure 10. The mean values stated in the table has been ≥2.500 and the total value of generally agree with 83.33%. Besides, the total value of generally disagree is 16.67%. This concludes that mostly the expert reviewers understand the ISGS, the scope and agree on the suitability of implementing an interactive storyline using the ISGS.

When all the findings are summed up, the features in ISGS is proven acceptable to be used by developer and designer, especially in the process of interpreting the interactive features and creating their storyline. Moreover, the evidence gathered in the study pointed out consistent by the percentage of the ISGS features and ISGS conclusion that contribute to 94.44% and 83.33% respectively. While 88.89% came from the overall percentage of the item chosen as generally agree to all parts in the questionnaire. The feedback from the evaluators will improve the complexity of the ISGS by increasing more interactive features in the structure as well.

Table 8. Evaluation's Results of The ISGS Conclusion – Summary Statistics

	Mean	Std. Deviation	No (%)	Not Sure (%)	Yes (%)
C1	2.8000	.42164	0	20	80
C2	2.8000	.42164	0	20	80
C3	2.9000	.31623	0	10	90
Total			**0**	**16.67**	**83.33**

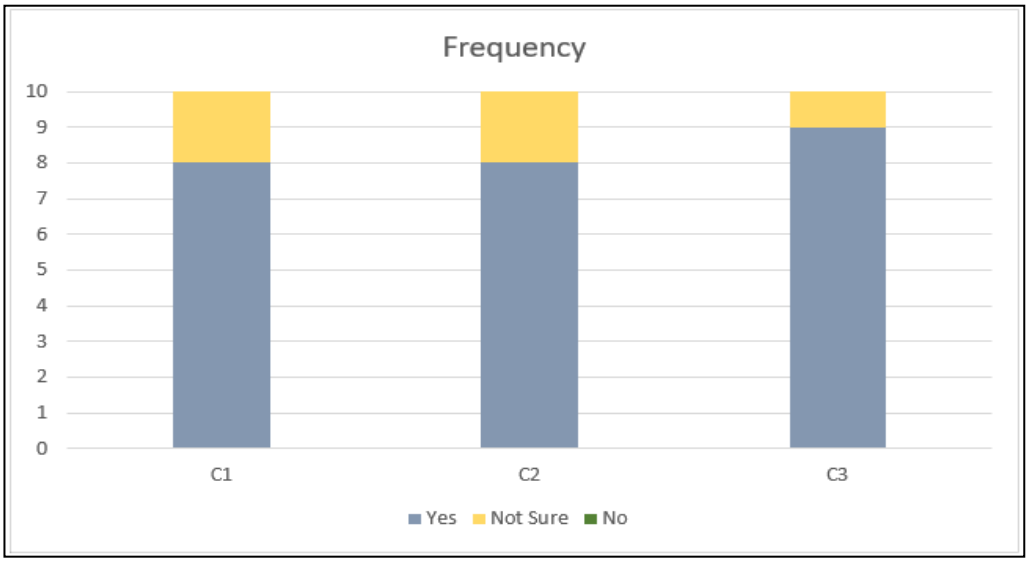

Figure 10. Frequency result (C1 - C3)

The test of reliability was constructed to define the consistency or dependable test that measures a characteristic (Mohajan, 2017). Based on Table 9, ISGS had a Cronbach's alpha of 0.854, while the C had a Cronbach's alpha of 0.914. These values have proven it is reliable as Cronbach's alpha should ≥0.70 (Taber, 2017). The validity also has been constructed to define what and how well the test measures a characteristic (Mohajan, 2017), in which the result is shown in Table 10. The KMO test for both ISGS and C were 0.663 and 0.500, respectively. The validity is strong as the values are ≥.5 (Houser, 2012). These conclude that the results of the study have been defined as trusted, consistent and accurate as the reliability and validity have reached the approvable value.

Table 9. Reliability Analysis Result – Summary Statistics

	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
ISGS (ISGS1.1 - ISGS3.6)	.854	.855	18
C (C1 - C3)	.914	.913	3

Table 10. Validity Analysis Result – Summary Statistics

	KMO Test	**Bartlett's test (sig)**
ISGS (ISGS1.1 - ISGS3.6)	.663	≤0.001
C (C1 - C3)	.500	≤0.001

6. Conclusion

The existing techniques of creating a flow for a storyline in a story structure, such as linear narrative, etc. are unable to incorporate the interactivity, iteration, and multi-option features. In addition, it is difficult for the designer and developer to create a flow of storyline freely as they desire. However, with the enhancement from the existing story structure and specialties in the story graph produces a new story structure called Interactive Story Graph Structure (ISGS). The use of ISGS, the designer and developer, can choose suitable symbols to apply to their story structure based on their storyline. Furthermore, based on the findings from data analysis, it shows that most experts accepted the new story structure as part of the process to interpret the interactive storyline for digital storytelling with a percentage of 88.89% from 10 expert reviewers. The ISGS is helpful in creating a flow of storyline before they can generate it to a digital storytelling application.

In future studies, the ISGS will analyze more interactive features add to the ISGS. The designer and developer can create the story structure with more variety of interactive storylines embedded with more interactive features provided. Besides, the ISGS will make the story structure more organized and clearer since the interactive features are getting more in the ISGS and including the feedback from the experts that have difficulties in the ISGS was defined it complex and complicated. Therefore, it is important to simplify the ISGS to ease the way to use and better understanding.

Acknowledgement

The authors would like to express appreciation for the support of the research grant 600-IRMI/PERDANA 5/3 BESTARI (097/2018) from Universiti Teknologi MARA (UiTM), Malaysia.

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