



Designing for Children

- With focus on 'Play + Learn'

Kahaani - An Interactive Floor

For the playful learning experience of children through stories.

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Abstract: *KAHAANI* is an interactive floor designed for children. The concept is a matrix where the child has to select characters and situations from the available alternatives and construct a story. The story built by the child will be played as an audio visual for the child, which in turn motivates him to explore the mystery element of selecting a different option every time. It deals with the elements of play, identification, anticipation, story building, dialog and storytelling. Also, other factors like physical interaction with the system in terms of walking or jumping on the floor and the ability of the system to captivate the child's interest also play a significant role in this concept. It will enhance their anticipation skills and improve their decision making abilities resulting into a constructive and interesting learning experience.

Key words: *Physical Interaction, Storytelling, Interface, Interactive Floor, Playful Learning, Story Building, Animation, Aesop's Fables*

1. Introduction

Stories are an integral and inseparable part of our childhoods. Despite being grown ups, we like stories and sometimes unknowingly, even implement them into our daily behavior patterns. A child is very similar, but more responsive. He/she directly takes the story and starts to live in the fantasy world of it - being like one of his favorite characters, understanding how it behaves and following his understanding of the story. *KAHAANI* explores the domain of stories and storytelling in the digital era by giving the child to explore and choose his own characters, his own situations and thus, make his own stories. This would equip him with decision making abilities and also would educate him with the concepts of 'cause and effect', 'good and bad' etc.

In the era of digital gaming being increasingly popular, we attempt to give the children something to play with not just on screen but also encouraging physical activity.

2. Background Story

2.1 Physical Play v/s Digital Gaming

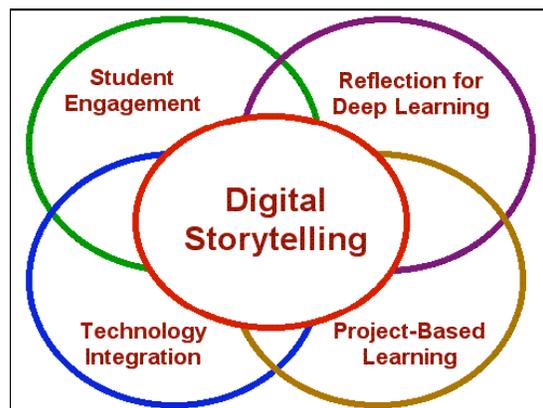
As we all know, digital gaming is at an all time high. This is not only because of the engrossing graphics, and strong multimedia, but also due to the fact that the parents do not want their child to lag behind. Physical play on the other hand is not much stressed upon neither by the parents nor by the children themselves. But, the fact is that it is much more important than digital gaming. There are several benefits of physical play like interacting socially, alleviating stress and mild to moderate depression etc.

Through this interactive floor, we attempt to combine the two by making them jump on it and then watching their own creation!

2.2 Storytelling in the Digital Era

Although a significant change has come but storytelling and story building still prevails. This may be through TV Serials, physical games or digital games. Each of them have their own importance and are necessary elements from time to time. Every character, every situation and even every line in the story matters to a child as he builds up his fantasy world around it. The fantasy element of stories allows children to reflect more clearly on real experiences through powerful imaginary experience. Donaldson (1978) observes that there exists 'a fundamental human urge to make sense of the world and bring it under deliberate control'. She argues that this urge for children to make meaning is best served in contexts not totally 'disembedded' from their world of experience. Stories, when comprehensible to children, have the advantage of being embedded in human concerns such as characters, events and binary themes, and yet offer the child the chance to 'decentre' from the immediacy of their personal lives. They become able to look at themselves through looking at and thinking about others (Robert Fischer-Teaching Thinking and Creativity, 1999).

Figure 1. Digital Storytelling

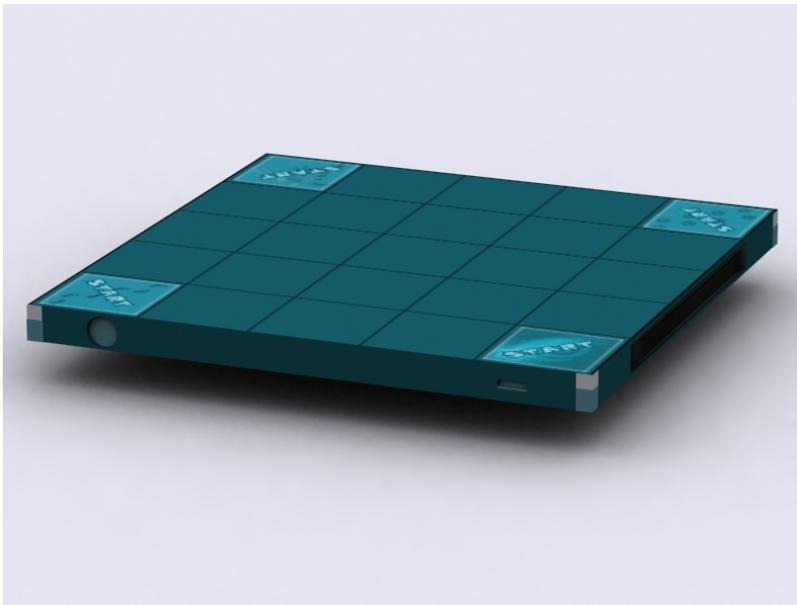


2.3 Why Aesop's Fables?

Aesop's Fables are an assorted collection of short stories which deliver a moral or learning at the end. The main characters of the stories are animals who are subjected to different conditions. Looking at the Indian context, 'PANCHATANTRA' and 'JATAK KATHAYEIN' provide a similar collection of animal stories. Upon user research, we found that children relate to them very easily and are quite curious about the happenings in the story of their favorite animal/character. The morals and teachings at the end of each story develop a sense of social and cultural behavior among them. It inspires them a lot and teaches them the valuable lessons of life, which in turn show them the path to becoming good citizens and better people.

3. KAHAANI - An Interactive Floor

Figure 2. Kahaani - A 3D view



The underlying idea for this concept was to enable children to live an ideal future with morals and values. Also to mention, while brainstorming for the same, we had to keep in mind that we do not provide any other interface for him/her to learn and then play with. While looking at a child's environment and surroundings we moved in onto interfaces either the wall or the floor. The floor was chosen from the two as children of the age 5-7 yrs. are hyperactive and would love colors, animals and physical activities along with that.

It is only after choosing the right interface that we moved on to choosing the mode through which the goals could be achieved.

On doing a user research on the children of that age, we found out that most of them had a flair for cartoons and stories. All of them liked to play games and many just won't let go of their computer/TV games.

Parents too tried to teach morals through stories and poems. Often, the grandparents (in case of joint families) took care of their grandchildren and hence the medium of storytelling and cartoons was taken up as the essence of this concept.

Moving on, we had to do an ergonomic study for designing the floor. The anthropometric data of children aged 5-7 yrs was taken in consideration and is summarized as under:

Table 1. Anthropometric data of foot lengths of children

Age in Years	Published Lengths	Findings
2-3 yrs.	6 1/8" to 6 1/2"	5 1/8" to 5 1/2"
4-6 yrs.	6 13/16" to 7 1/2"	6 1/4" to 7 1/2"
7-8 yrs.	7 1/2" to 8 1/2"	7" to 8 1/8"

Figure 3. Average foot size of a child



After analyzing the foot lengths of the children, we further decided to keep the size of each unit from the floor as twice the foot length, i.e. 30 centimeters. This approximation was taken due to the fact that the children would also need to look where they are standing and what do they want to do next.

The result of all this was an interactive floor with a matrix of 5X5, i.e. 25 options on it.

The child starts from the corners which are the trigger points and ends at one of them.

Each corner carries a theme of stories and the iconic representations of each theme could be clearly seen on them. The chosen themes were:

- i. Aesop's Fables
- ii. Fairytales
- iii. Superheroes
- iv. Human life stories like Akbar - Birbal etc.

The choice of the themes is based on the user research patterns of children. The inclusion of both fairytales and superheroes caters to girls and boys alike so that no group is left unattended.

The color of the floor is kept in accordance with color theory and child psychology. It is calm yet dynamic and the variety of colors pooled in through visuals and animations add an extra interest for them.

3.1 Why take a 5X5 matrix?

Looking at the heart of storytelling, be it digital, comical, TV, or for that matter, any form, has the following key elements:

- i. Overview of the Character,
- ii. Setting,
- iii. Plot, & ,
- iv. Backstory.

These constitute the basic structure of the story. Everything else is a wraparound to give the story a mass and volume. Since we are combining the art of storytelling within a digital interface, the following key elements come into play:

- i. A point of view (first person, third person etc.),
- ii. A dramatic question (what happens next?? The plot of the story),
- iii. Emotional content,
- iv. The gift of voice,
- v. The power of a soundtrack,
- vi. Economy, and,
- vii. Pacing.

During play, the child comes in contact with the first three elements directly. Others serve as an add-on because the animation itself becomes much captivating for the child. It was then that these three were combined with the previous four elements. Now, to keep the child's interest, we let him make a choice of his own characters & the situations it may be in. Looking from the psychological point of view, neither should the game be too small that the child leaves it after sometime and nor should it be too long to complete so that he leaves it on getting bored. Taking a 5X5 matrix provided us with enough number of interactions to keep him engrossed and interested.

3.2 Interactions with the floor

As the mode of interaction was taken to be the floor, the interactions are intuitive, like walking, jumping etc.

The flow of interactions is as under:

- i. The child stands on a start point and activates the subsequent options.
- ii. He may choose to jump on any of the given choices.

- iii. If the child jumps on a non triggered block, the floor will not react, rather, it will be reset if it is left unattended after that. On completion of 5 minutes, it shuts down by itself.
- iv. On further going down the storyline, if at any point of time he/she wishes to change a previous choice they made, they can go back to the predecessor and make the desired choice.
- v. A remote and a touch sensitive LED panel have been provided to handle functions like volume control, ON/OFF, Play, Pause & Stop etc. (Figure 4).

Figure 4. Touch Sensitive LED Panel



3.3 Functions of the floor

KAHAANI uses the medium of non linear storytelling to take the child ahead. For the child, the stories are almost endless and they are pretty non-linear. But, we had designed it in such a manner that the story being played and the choice of characters are related.

Another point is that, not complete freedom has been provided to the child. He does not have all the adjacent options available while standing on a block.

The floor follows a top down approach where the trigger points for the themes are on the corners and they serve as the starting points.

- i. The child chooses a starting point from the four diagonal points (Figure 5(a)).
- ii. He gets three choices in front of him (Figure 5(a)).
- iii. If he chooses one from the diagonal line, he gets three more options.
- iv. On the other hand, if he chooses otherwise, only two choices are given to him (Figure 5(b)).
- v. Since it is a top-down approach, the story ends at the diagonal opposite or on the opposite 'end point'.
- vi. As soon as he/she gets off the floor, the path taken by them is further illuminated and a story is played as an animation on the floor. The most interesting part for the child is that the story played has been made by him and all the characters and situations are those that were decided by him, giving him a whole new experience and excitement altogether.
- vii. When only one of the 'end points' remains as the choice, it is illuminated more and the other two end points are removed. However, as mentioned earlier, they may reappear if the child wishes to step back.

Figure 5(a).



Figure 5(b).



3.4 Technical aspects and know-how

The two major components within the floor are:

- i. LCD Screens, and,
- ii. Infra Red / Pressure Sensors.

The floor is so constructed that each corner has an IR sensor. All the sensors work to determine the position of the child on the floor. According to that, the subsequent visuals are changed on screens. There are 25 screens of 30X30cm² each. All of them are covered with a transparent protective covering like carbon fiber/thick glass/acrylic etc. The protective layer is kept so as to shield the screens from getting damaged. A motherboard is also integrated within the floor which takes in all the data from the sensors, processes it and changes the screen images as per the need.

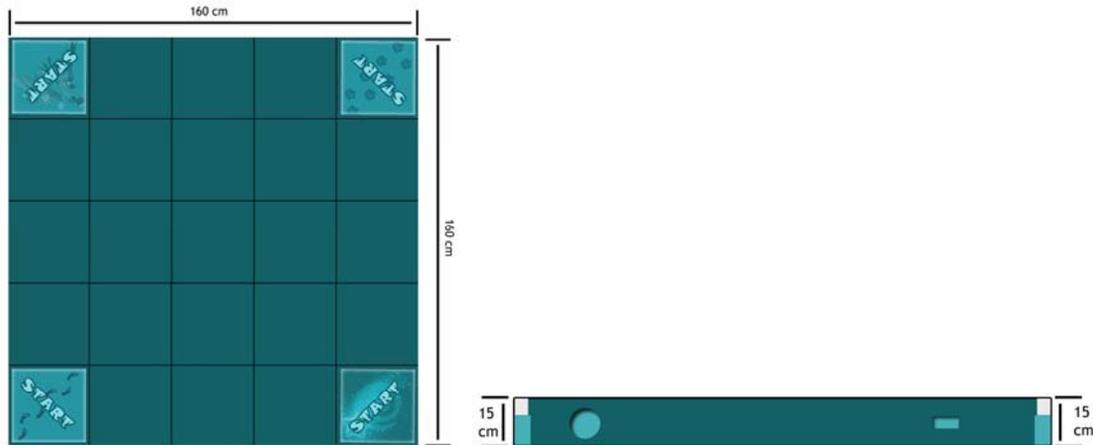
An alternative approach of doing the same is by the use of pressure sensors beneath each tile. They send the signal to the motherboard, which in turn displays the respective images on the screens.

Some other components added are as under:

- i. Battery: A rechargeable battery has been integrated within the hood with a charging slot on one of the side panels of the floor.
- ii. Remote: The remote, as already been discussed, has been provided within a slot in the floor itself. The slot is on the same panel as that of the charging slot. The IR signal receiver from the remote is placed around the central tile like a belt. This is to ensure equal reception of signals from all four sides.
- iii. Battery level put on the opposite side panels for stereophonic sound during the play of the animation.
- iv. An LED touch sensitive panel also has been provided on one of the side panels to control volume, ON/OFF, Play, Pause and Stop etc.

3.5 Physical dimensions of the floor

Figure 6. Dimensions of the floor



The floor stands at a height of 15 cms, taking into account all the added components. Since it has a 5X5 matrix of tiles with each tile being 30 X 30 cm², the size of the floor approximates to 160 X 160 cm² i.e. around 5.25ft X 5.25ft.

Conclusion

From the research and study of the above topics, we conclude that coming up with such a product will result in a playful interactive experience for children. Today when computer games and television have overpowered outdoor games this is an attempt to encourage physical activity in children in the form of interacting with the floor. Also, it will enhance their anticipation skills and improve their decision making abilities resulting into a constructive and interesting experience.

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