Interactive Educational Applications for Children Using Microsoft Kinect Sensor

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Abstract— Interactive educational applications becoming the medium for learning and increases the children’s ability to learn quickly. Microsoft kinect sensor which is motion sensing device, used to develop number of applications. In this paper we concentrated on developing only educational applications using kinect. Also comparison is done with other motion sensing and other devices used in the field of education and shown that kinect has the better potential. In this research, we propose new educational applications for children which provide interactive learning.

Key words: Microsoft Kinect, Educational Applications, Motion Sensing Device

I. INTRODUCTION

To develop a technology, we need knowledge i.e., proper education. Once technology is built, it can be used to improve the quality of education and brings out innovative ways of learning. In our paper technology refers to Microsoft kinect sensor. It is a motion sensing input device by Microsoft for the xbox 360 video game console, which can capture, track and decipher body movements, gestures and voice[1].

The kinect device which was originally evolved as gaming console, can be used to develop numerous interactive applications. Children find these applications are interesting way to learn. Also these applications challenges the thinking ability of the children, making them to learn things in a different way. The benefits of integrating technology into the classroom include meeting the needs of visual learners, more interactively teaching whole-class lessons, and better engaging students [2]. In our paper, we propose such applications which help children to learn the basic foundation knowledge.

II. BACKGROUND

There are many technologies which improve the quality of education and makes teaching-learning as interactive. Sony PlayStation Portable (PSP) and other brands of Portable Media players (PMP) are very good platforms for delivering educational contents to distance learners in podcast mode[1].

<table>
<thead>
<tr>
<th>No.</th>
<th>Sensors Features</th>
<th>Creative Sense3D</th>
<th>D-Imager</th>
<th>ASUS, Xtion PRO LIVE</th>
<th>Microsoft Kinect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stepper Motor</td>
<td>No</td>
<td>No</td>
<td>No, only manual positioning</td>
<td>Yes, controlled programmatically</td>
</tr>
<tr>
<td>2</td>
<td>Accelerometer</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Microphone array</td>
<td>Yes, dual-array microphone</td>
<td>No</td>
<td>Yes, dual-array microphone</td>
<td>Yes, 4 array microphone</td>
</tr>
<tr>
<td>4</td>
<td>RGB camera</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>Depth Sensor</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

PSP has a wireless Internet browser working with open format web programs like HTML, XML, Flash and JavaScript. There is also a built in timer to download audio and video RSS feeds. This will allow students easier and immediate access to academic web sites and Virtual Learning Environments. Second Sight on PSP enhances student and teacher’s access to audio, video and interactive educational content. Second Sight enables teachers to blend the use of their established text books, display materials and audio visual content in a way that has not been easy to deploy in the classroom before[2].

The Xtion PRO LIVE, a ASUS product uses infrared sensors, adaptive depth detection technology, color image sensing and audio stream to capture a users’ real-time image, movement, and voice, making user tracking more precise. The Xtion PRO LIVE development solution comes with a set of developer tools to make it easier for developers to create their own gesture-based applications without the need to write complex programming algorithms[3]. But it is a less popular device, has lower drivers quality. It does not work with some USB controllers (especially USB 3.0). No motor, allow only manual positioning.

The D-Imager is a 3D image sensor by Panasonic measures precise pixel by pixel distance data and performs motion capturing to enable gesture controlled applications for interactive digital entertainment[4]. But it doesn’t include accelerometer, stepper motor, microphone array, RGB camera and has less resolution which makes gesture-based applications less effective and interactive. Unfortunately D-Imager has been discontinued from December 2014.

Creative Sense3D Depth and gesture camera has hand gestures control, can give voice commands for applications. It's also a 720p HD webcam with a dual-array microphone for video recording and chatting needs[5]. But it doesn’t include skeleton tracking and it is not cross-platform.

TABLE 1 shows the comparison between the various sensors and kinect sensor. From the table we can infer that kinect has better features than other device, hence more suitable for developing interactive applications. Before the digital applications or games were used for educational purposes,
Physical activities are the major medium for the learning. As people started using computers in everyday life, teaching institutes started adopting computers for educational purpose, making digital education. In the future of education, interactive applications or games making children engage in learning. Microsoft kinect is one such system, which makes teaching-learning as interactive.

III. PROPOSED APPLICATIONS

In our paper, we have proposed three interactive applications for children aged between 4 to 8.

A. First Application – Swachaapp:

Many of the children and some youngsters are not aware of that we have to segregate the wastes before we put into the dustbins. Through our application, we educate children about segregation of wastes into different color coded dustbins.

Ideally every place where we discard the waste should have three dust bins.

- Green - for wet waste, which comes from the kitchen/cooking/food, goes to one bin.
- Blue - dry recyclable wastes such as newspapers, cardboards, packing, plastics, bottles cans etc., should go to different bin.
- Red - reject waste, which doesn’t belong to above two categories, including bio waste like diaper and bandages should go into the third bin.

B. Second Application – Knowing CM’s of the States:

This application helps children to identify the chief minister of respective states. This will develop the social and political knowledge of children.

Fig 2. Shows the proposed layout of the application. On the top few images of CM’s with their names will be displayed. Below respective states name will be displayed in a random order. User has to point out on the image and drag it to its correct state displayed below. User considered to be successful only if he drags the images to correct location. By this way children will be learning the CM’s of the states in a interactive manner.

C. Third Application – Knowing Capital Cities of the States:

This application will help children in knowing the capital cities of the states. Through this application children will be able remember the capitals cities in much effective way.

Fig 3. Shows the proposed layout for the third application. On the top few capital cities will be displayed, below respective states are also displayed in random order. User has to point out on capital city displayed and drag it to its respective state.
IV. CONCLUSION
As many technologies have been using for the educational purposes. We have taken Microsoft Kinect for developing interactive educational applications. Microsoft has released SDK which helps in developing such applications. In our paper we have proposed three new applications for interactive learning. These applications show the new way of teaching-learning environment.

V. FUTURE WORK
In our future work, we will implement our proposed applications. Also we would like to implement more such interactive applications. First we would like to develop prototype of our proposed applications. Then, we will develop it as full-fledged applications. After the successful testing, we would deliver the applications at educational institutes.

REFERENCES