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THE EFFECTS OF USING KINECT SENSORS IN EDUCATION ON CLASS MANAGEMENT

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ABSTRACT

Nowadays using technology may increase the quality of education. Kinect Sensors which firstly developed for games started to being used in education to control interactive whiteborads. Some applications are being developed in this area. In this study, we aimed to see the effects of kinect sensors on class management. In our study, using interactive whiteboards is achieved by using motion and sound sensors without any control device . Develeoped application was tried in the classrooms and teachers opinions recorded. From the teacher's point of view, application was evaluated in terms of educational sciences.

KEYWORDS: Class Management, Education, Kinect, Technology.

INTRODUCTION

Using interactive whiteboards in the classrooms brings some ease to teachers like using visual materials, reaching online documents and attracting the attention of students. Despite all these developments, teachers may have problems like using touch screen, adherence to the board, turn back to students and not moving freely in the classroom. This situation negatively affects using body language and classroom management. These problems may cause burnout syndrome (Avcı & Seferoğlu, 2011). Class management is one of the most important component of educaiton. Giving a quality education is largely dependent on classroom management (Paliç & Keleş, 2011). If the teacher can have control the classroom teaching activities will be more easy. The position of the teacher in the classroom is important for the

activity where it will perform. We can increase the benefit of the activities by standing in the right place , at the right time and providing the right interaction. The teacher should try not to turn back even when he uses the board to see the entire class (Şen, 2006). According to new values in education emphasis is on student (Özden, 2002). The teacher must be a guide for teaching and students have to produce new informations from data by actively participate educational process.

Kinect is a sensor developed by microsoft provides control computers without any control device. (Andersen et al., 2012). In a previous study the positions of fingers were recognized by Kinect (Frati & Prattichizzo, 2011). Gesture recognition like applause, speaking on the phone and waving hands enabled developing a lot of applications (Biswas & Basu, 2011). By the Kinect Sensor's able to recognize the human skeleton and joints, health and rehabilitation applications were developed (LaBelle, 2011). There are researches about the potential of Kinect Sensors in education too (Hsu, 2011). In our study , we wanted to use interactive whiteboards by kinect sensors without any control device like keyboard and mouse. In this way teacher will be able to move freely in the classroom, use body language effectively and control the classroom easily.

MATERİALS AND METHODS

A kinect V2 for Windows sensor and an interactive whiteboard used as hardware in this study. A dekstop application was developed to open visual materilas like video, images, pdf books and slideshows in Visual Studio with C#. Develeoped application was tried in the classrooms and teachers opinions recorded. From the teacher's point of view, application was evaluated in terms of educational sciences.

1.Kinect V2 Sensor: Kinect sensor firstly produced for Xbox 360 gaming console and by the success it sold over 10 million (Andersen et al., 2012). The sensor has been made compatible with Windows operating systems later. This sensor provides us to control computers with gestures and sound commands without any input device like keyboard and mouse. Kinect for Windows Sdk published by Microsoft allows us to many process like taking color images, working on depth values, following human skeleton, knowing the coordinates of joints and recognizing gestures. In this way sensor is used in many areas like shown in Figure-1.(Jana, 2012)

Figure 1: Kinect Usage Areas.

There are color camera, IR emitter, IR camera and microphone array in the sensor like shown in Figure 2 so it can help recognize sound and motions (Zhang, 2012).

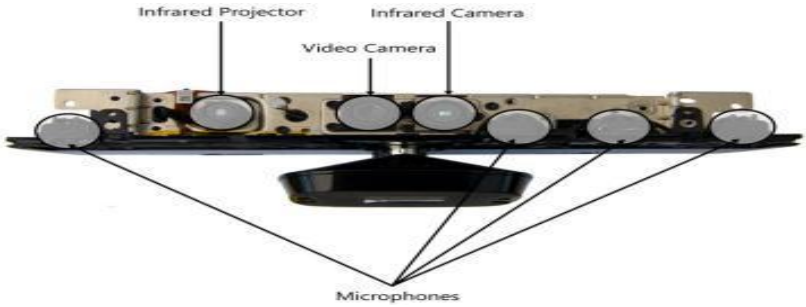

Figure 2: Kinect Sensor.

The micropohne array helps us a quality sound recognition and realize the direction of the sound. In 2014 the second version of the Kinect was released to the Market. Differences between Version 1 and Version 2 were compared in Table 1 and we decided to use Kinect V2 for our project.

Table 1: Comparing Kinect V1 –V2.

Component	V1	V2
Technic	Structured Light	Flight Time
Depth Sensor	1.8 to 3.5 m	1.3 to 3.5 m
IR Depth Image	320*240	512*424
Color Image	640*480	1920*1080
IR image	No IR	512*424
Horizontal Angle	57 Degree	70 Degree
Vertical Angle	43 Degree	60 Degree
Minimum delay	102 ms	20-60 ms

The RGB camera is used for taking color images and record videos. The frames taken by the camera are moved to computer as an array. The frame transfer speed is 30 FPS. The most powerful ability of the Kinect is measuring the distances of the objects. Further there is a tilt motor for sloping surfaces so the human skeleton can be recognized correctly.

2.Kinect 2 Windows SDK: The Software Development Kit published in October 2014 provides gesture and sound recognition by using hardware. We can develop applications with SDK and publish them in Windows Store. With functions in Kinect SDK, images taken from the Kinect Camera is transfered to computer as imagestream. Color image stream holds the red, green and bule values of the pixels. Depth image streams hold the depth value of the pixels. RGB, YUV and Bayer image formats are supported by Kinect. Kinect can see in the dark with the Infrared Frame Reader method. We can work on frames by the Frame Arrived method. The Kinect Studio Apllication in SDK helps us try Kinect and recording images and videos like shown in Figure 3.

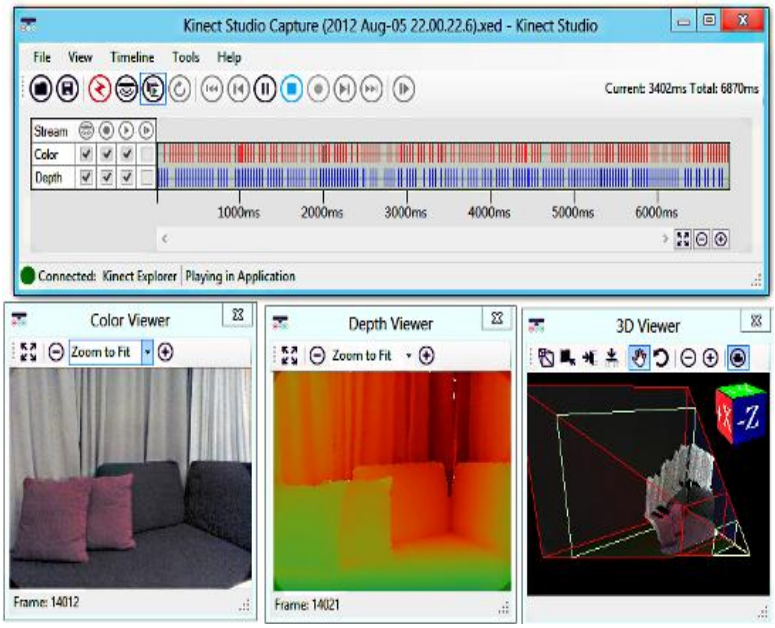

Figure 3: Kinect Studio.

3. Visual Studio C#: After the interactive whiteboard and kinect ready we started to develop our application in Visual Studio with C# programming language. After the installation the Kinect sensors light turned yellow and sensor was ready. Kinect sensor automatically turn the sleep mode when no application use it. We developed our applicaiton as a new design Windows Presentation Foundation(WPF) (Sells & Griffiths, 2005). When we examined the materials used in the classroom, we saw that the most pdf books, images, slideshows and

videos were used. We add all these functionalties to our application. Firstly we import SDK libraries into Visual Studio to use SDK functions. We benefited from handpointer class to control images, books and slideshows. If we put the contents in KinectRegion handpointer method is automatically activated. We can use our hands like a mouse. We can click buttons, we can use zoom in - zoom out funcitons and we can drag. Before the control we have to engage with the sensor by moving our hand up. One of the advanteges of SDK Gesture Builder. Gesture Builder uses artificant inteligance and image processing to make new gestures. We record original gestures and sensor recognizes them when gestures are seen again. We can listen event handlers and use gestures as a command. In our study we record a video clip for education in artificial intelligence as shown in Figure 4. We defined two gestures and named them NP_Left and NP_Right. After this we marked gestures and education started. Later we recognized these gestures %100 accuracy rate. We used these gestures as next and previous command.

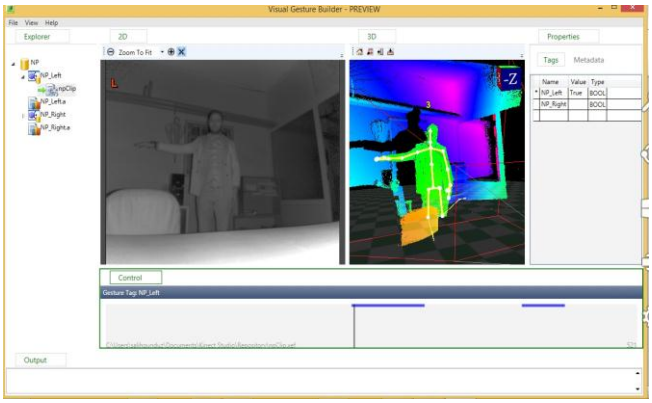

Figure 4: Marking gestures.

RESULTS AND DİSCUSSİON

Firstly, sensor has been used in Şarköy Meslek ve Tekknik Eğitim Merkezi Information Technologies Classroom in order to test the usability of the sensor within the classroom. Interactive whiteboard with Windows 8 operating system has a usb 3.0 connection so we could connect Kinect and we installed drivers without any problem. It has been seen that the camera can see the entire class. We could access the sensor from points like shown in Figure.5.

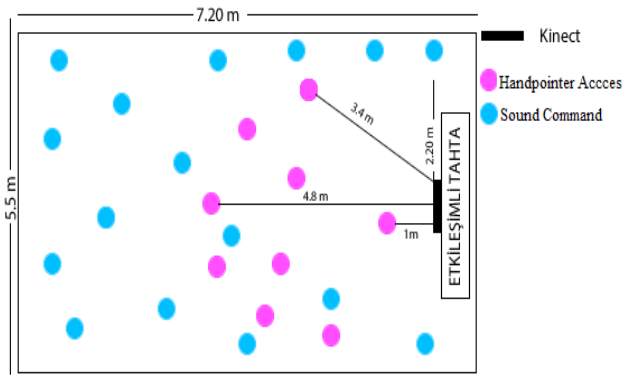

Figure 5: Kinect access points.

Measurements showed that Kinect can be used easily in the classrom. The distance from the handpointer was 4.8 meters. Access from the side angles has been reduced by 3.4 meters. Voice access is available from anywhere in the classroom. It has been seen that voice recognition ability is more successful than normal microphones. After all these experiments the application was developed tested by 17 different teachers. In this study, the interview method was used when the opinions of the teachers were taken. Educational scientists have used interviewing at important level in examining social events (Türnüklü, 2000). We asked the effect of the application on classroom management and answers like that:

T1:" Class dominance can be provided more easily because it is roamed in the classroom. We will return to our students less. I think it will make class management easier."

T2:" The class control is more effective because it appeals with multiple sense."

T3:" The teacher will be more comfortable with the students because they can freely move around in the classroom"

T4:" The class dominance is increasing because we do not go back to the students. It can be used up to 5 meters in the classroom. This facilitates class dominance."

T5:" Teaching lectures by moving in class will facilitate class dominance rather than writing on the whiteboard ."

T6:" Because we are close to the students, the class dominance is increasing because we can move between them. We can use body language more effectively."

T7:" Class dominance becomes easier because we can move around the classroom, and it contributes to the focus of the class on the subject."

T8:" I think that it will impress students positively."

T9:" In mathematics classes I will be able to get away from the whiteboard. With the participation of the students, the interest in the course will increase and the discipline of the class will be made easier."

T10:" I believe that it will increase class dominance because it allows us to freely navigate during the lesson."

T11:" It has a positive impact on classroom management. It allows free circulation within the class without being attached to the table. This facilitates classroom management."

T12:" As it saves time, it can be a positive contribution to the course flow."

T13:" When we stand by the side of the board and turn back the class, the dominance of the class is diminishing. We can use the interactive whiteboard when moving in this class."

T14:" The class dominance becomes easier by not to be addicted to the interactive whiteboard. It contributes to the efficient use of time."

T15:" Classroom management will be easier because the teacher can use the body language more easily without returning to the interactive board."

T16:" The class dominance will increase by one hundred percent as the teacher can get the class and the interactive board wide angle. The combination of voice command and practical use will keep the student in lesson by question and answer."

T17:" Class management in the classroom can be provided more easily."
The answers given are examined. Frequency and percentages of responses are presented in Table 2.

Table 2: Contribution of application to classroom management.

Answers	Teachers	f	%
Allows easy travel within the classroom.	T1, T2, T3, T4, T5, T6, T7, T9, T10, T11, T13, T14, T16, T17	14	82,3
It allows us to address more than one sensory organs.	T2	1	5,8
It allows you to use your body language effectively.	T1, T4, T6, T15	4	23,5
It saves time.	T12	1	5,8

Examining Table 2, the teachers said that the application would be useful for classroom management. It has been seen that the most important effect of classroom management of practice is to be able to walk freely within the class without being bound to the interactive wihteboard. Atıcı (2001)stated that student participation would increase if effective classroom management is provided.

CONCLUSİONS

The obtained sensor was tested at the Şarköy Vocational and Technical Education Center of the Ministry of National Education. The sensor has been tested primarily in terms of competence and it has been shown that sensor access in the class is possible with both voice and handpointer. Then the developed application was tried in the classroom and it was seen in the opinions of the teachers that the application reached to its purpose on a large scale. All of the teachers said that such an application would facilitate classroom management. Eighty-two percent of teachers said move within the classroom will facilitate classroom management. The teacher who travels in the classroom will be able to use the body language better and interact with the students individually so that the classroom discipline will be more comfortable. If the teacher does not need to turn back to the students, he will be able to watch student behaviors. Effective classroom management can also increase student participation and course success.

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