INTERACTIVE TOUCH SURFACE USING WII -MOTE

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Abstract: *In today's world teaching learning process is going on in fast mode. We all need extra devices and software to explore our knowledge in digital world. Many of us use technology to do so. But still to show something in bigger level then we are dependent on projector and screen only. But there are many problems to do this. Now here we are proposing the system where using partial hand wearable system, mini projection system and special camera, we can now convert any flat surface in to touch screen system. Main challenge behind the projector, camera and wearable computer system set up is proper placement of every component in order to give ease of system accessing. This prototype system shows that the touch sensing is very robust and works flawlessly almost any surface including non-flat surface. This project can effectively overcome several limitations existed in previous systems.*

Key Words: *hand wearable glove, Multi touch, IR Camera, projector system.*

1. INTRODUCTION:

Information Technology has advanced tremendously over the past few decades especially on HCI (Human Computer Interaction). Research on HCI has been very active where plenty of companies and research groups are actively researching and improving on this field. HCI minimize the barrier between human and computer by understanding the user's intention. One of the most famous interaction methods is touch sensing because it is the most natural way for human to interact with computer as touch is the most sensitive sense among human's five senses. The main advantage of touch technology is the system is able to work simultaneously on data input and system controlling. There are various methods to implement a touch system, which are normally categorized into two types: Sensor-based and Vision based.

As people knows about the interactive surface system or also known as Interactive White Board available in the market. These types of Interactive white boards are very expensive. Making such a big purchase may not be feasible for a Personal teacher, Small School or Small business. There is, however, a way to build an interactive white board for comparatively little money. Recently, capacitive touch sensor has replaced resistive touch sensor as the most frequently used touch sensing technology, as seen on different touch devices. The touch surface is coated with conductive material. When a small voltage is applied to this layer via some conductive object such as fingers, the coordinate of the object can be detected. It is able to detect multiple touch points, but it greatly depends on the conductive material. Yet, this method still possesses many restrictions on touching. Non-conductive object will not trigger the touch action. On the other hand, there are different methods in vision based touch system too. The most frequently used methods are FTIR (Frustrated Total Internal Reflection), DI (Diffused Illumination) and LLP (Laser Light Plane Illumination). All of these methods have a common characteristic which is IR (Infrared) Sensor with IR Emitter are being used. Each method is differentiated by the IR sensor's position and the IR emitting method. They do have a common advantage, which is very robust at detecting touch points. However, their weakness is they are very sensitive at illumination. In order to work perfectly, a stable environment is preferred. Existing touch systems mostly focused on small devices such as smart-phones and portable devices. There are large multi touch systems available such as Microsoft Surface but it is extremely expensive. This system proposes and develops a new surface multi-touch system using low cost camera. This system requires only a single camera for the touch detection without any support of other devices. The system is very robust and does not affect by illuminations of surrounding environment. It is also able to work on almost any surface including non-flat surface.

Over the last few years, Human Computer Interaction (HCI) conquers the interest in field of research as well as our practical life. Modern Graphical user interface (GUI), which is a current standard interface on personal computers (PCs), is well defined, and it provides an efficient interface for a user to use various applications on a computer. Present days, touch screen technology is being used in many devices but it also needs complex hardware implementation. So it's our crying need to introduce a cheap, feasible & reliable system to interact between computer & user with the feeling of smart environment. From this point of view, we can use computer vision technology to overcome our limitation. In this paper, we propose a novel approach to design an interactive surface. In our method we use IR camera to convert a surface into that and to detect fingertip for controlling mouse command. To detect fingertip we use color range matching

through RGB channels. Also the surface coordinate is mapped into PC screen coordinate. Hand gesture recognition method is used to control mouse e.g. left click, right click, mouse move, etc.

2. LITERATURE SURVEY:

Xiaoqiong Wang and Liwei Wang propose a large screen multi-touch system integrated with multi-projector. It uses multiple infrared cameras behind the screen to capture the image changes in multi-user finger contact surface, filters the visible light images projected by projectors, collects the remaining infrared image and transfers it into a computer, then detects and tracks various operations of multi-fingers via image recognition algorithm Antti Virolainen, Arto Puikkonen and Tuula Kärkkäinen propseda multitouch screen using a material which has been very little (or not at all) used in pervasive computing – ice. In this paper, installation demonstrating the system, and collect feedback on it. They provide their experience of building a multi-touch display from an unconventional material, and the views of what should be taken into account when designing an interactive ice installation. In addition, they seek to offer an inspirational viewpoint on how interactive systems could be integrated to everyday life environments .H. M. Elfekey and H. A. Bastawrous present a new touch sensing technique for the implementation of a simple and cost-effective touch keyboard based on the AC hum phenomenon which exists in the vicinity of any AC source .

3. RESEARCH METHODOLOGY:

Main base of proposed system is proper synchronization between the IR camera which will be used to locate the moving IR pointer device and projector which will be used to convert plane surface in to display.

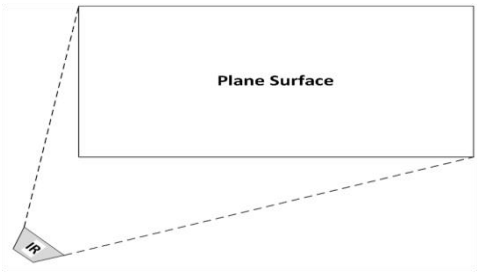

Figure 1 : IR Plane

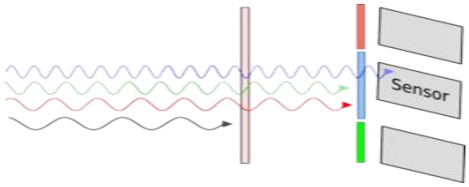

Figure 2: Web camera

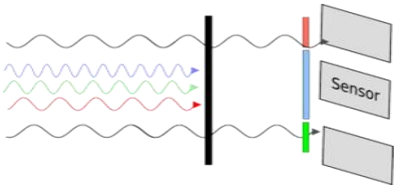

Figure 3: IR camera

Diff. X = IR X - Projector X, □Real X = Current X – Diff X
Diff. Y = IR Y -Projector Y, _Real Y = Current Y – Diff
The main objective of this research is to verify the touch
area by using information from IR camera. We use different approaches with existing methods to verify the
touch area on flat and non-flat surface. In this, we first performed our experiment in a stable environment by selecting a flat table, followed by experiment on non-flat
surfaces.

- **Algorithm:**

To find out the Real X and Y Co-ordinates

- Step1: Assuming IR camera resolution.
- Step2: Give the margin to get workable capture area.
- Step3: Calibration Captured Resolution.
- Step4: Finding maximum available display resolution Area.
- Step5: To calculate X, Y Co-ordinates for Calibrated Operational area.
  Calculate Real X & Real Y
  Diff. X = IR X - Projector X → (1)
  Real X = Current X – Diff X
  Diff. Y = IR Y - Projector Y → (2)
  Real Y = Current Y – Diff Y
  Step 6: Finding the percentage of Calibrated co-ordinates in calibrated area as follows:
  % of X in calibrated = Real X * 100/Total calibration area X → (3)
  % of Y in calibrated = Real Y * 100/Total calibration area Y → (4)

4. PROPOSED PLAN OF WORK:

Proposed system is mainly wireless system in which we use hand wearable system (gloves).IR camera detects the touch point through the sensor on the gloves? Design are to be consider as follows:

- Designing and implementing HCI device.
- The system can detect hand gestures through short range camera.

- Display of output through mini projection system.
- Using mini projector we can plot output almost on any platform.
- Multi -touch provides capabilities similar to that of a mouse or touch screen: X and Y location in2D interfaces and whether fingers are "clicked" or hovering, enabling a wide variety of interactions.
- Providing visual paint brush application for drawing purpose, due to this user get more flexibility to draw than mouse control.
- Color selector Brush width etc.

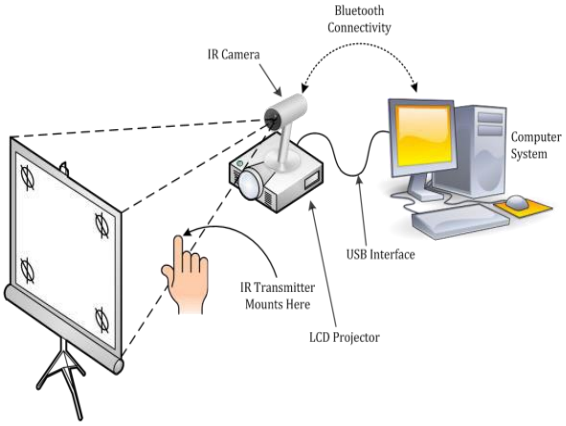

Figure 4: System Architecture

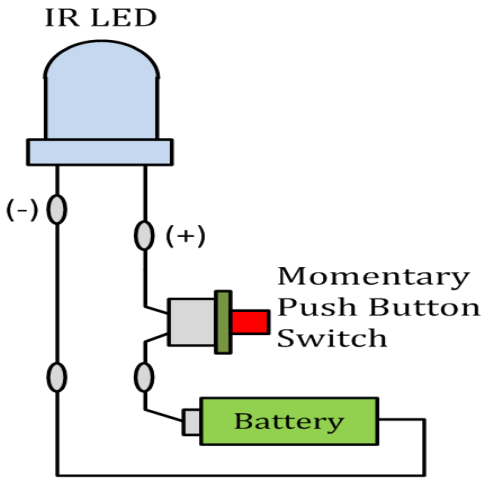

Figure 5: IR Transmitter

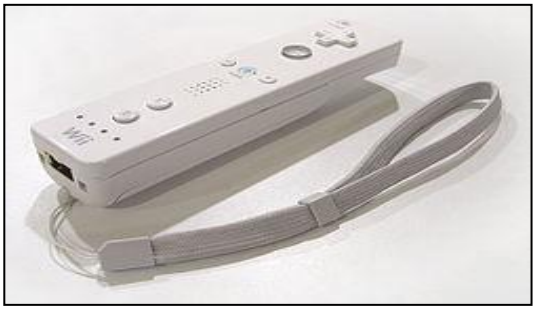

Figure 6: Wii Mote

5. RESULT ANALYSIS:

The following Table shows comparison with existing system:

	Smart Education	Touch Screen	Wii-Mote
Cost	Highest	Lower	Cheap
Installation	Fixed	Portable	Portable
Surface	Solid Only	In built	Solid & Canvas
Screen Size	Wall mounted (Normally) so limited	Fixed	Varying and adjustable
Size factor	Big	Flat but variable	small

Figure 6: Comparison Table

6. CONCLUSION:

Although there are various methods of multi-touch systems proposed, it is difficult to be used as applications because of high complexity of structure, high cost, and low display capability. Hand gesture recognitions is the way to interact with vision enabled computers and other machines. To achieve high applicability and complement these disadvantage , the propose system primarily focused on the study of work done in the area of hand gesture recognition using single camera, mini projection system and partial hand wearable system ,Which convert any flat surface in to touch screen system. User can easily access wall, desk, canvas, etc. surface as a computer display system and control all the computation activity of the computer.

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