SIXTH SENSE GADGET

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Abstract - This paper focuses on an emerging technology asset-The Sixth Sense Gadget. The Sixth Sense is an Extrasensory Perception which has developed into a new domain called ‘The Sixth Sense Technology’. The most essential information that can aid us to take the right decision and judgments may not be accessed using our five innate senses, namely the data and information. [1]Sixth Sense Gadget is a wearable gestural interface that nexuses the physical world around us to the substantial digital data and allows us to use our natural mitt gestures to interact with the digital data. Sixth Sense Gadget comprises of pico-projector in link with a camera and a laptop. The micro-projector projects the information on any surface, including any object or even our hand. The camera acknowledges objects around a person forthwith and then this camera feed can be processed to access or manipulate the information using fingers. There are many applications of the device ranging from simple calculators to clicking and playing with images and making telephony calls or painting onto a virtual paint board with simple hand gestures.

Keywords - Sixth Sense Technology, Image processing, qrcode, hue-saturation-value, Augmented reality, Real time Image processing, computer vision.

I. INTRODUCTION

Almost since the origin of humans, we have been perpetually using our five innate senses to analyze the world around us or to perceive information about something, someone or some place, we encounter. This information antecedently assists us in making judgments and espouses the appropriate action to be taken. But arguably, the most essential information that can aid us to take the right decision and judgments may not be accessed using our five senses, namely the data and information or knowledge that human race has accrued about everything and which is increasingly procurable online. Usually the information’s are written down traditionally on a paper or saved onto the digital storage devices. Sixth sense technology helps to narrow down the gap between palpable and impalpable world. Sixth sense technology is a technology that can be used to bring the digital world into the real world with a minimum effort & a higher accuracy. [2][3] Sixth Sense Gadget is wearable gesture controlled device that launches the digital information out of the laptops and lets people interact with that information with basic natural hand gestures. It inherits various concepts of image processing and augmented reality & has well implemented the perception of it. Steve Mann is reckoned as the father of Sixth Sense who implemented the Sixth Sense device as the neck worn projector with a camera system which Mann originally called it as [4] “Synthetic Synesthesia of the Sixth Sense”.

II. BASIC COMPONENTS

It consists of certain commonly procurable components, which are intrinsic to its operation.

These include a camera, a laptop and a [5] portable battery-powered projection system coupled with a mirror. The components communicate with the laptop, which functions as the communication and computation device. The entire hardware setup is encompassed in a mobile wearable device which is pendant shaped. Fundamentally the camera recognizes individuals, pictures, images, gestures one forms with their hands and the projector aids in projecting any information on whatever type of available surface present in front of the user. The mirror is significantly required as the projector dangles pointing downwards from the neck. The software program compiles the video signal captured by the camera and also provides the position of the colored markers by employing techniques of image processing and computer vision. One can have a large number of possible mit gestures and actions as long as they are all sensibly known and classified or distinguished for the system to decode or understand it, preferably through unique and varied fiducially. This is viable for the reason that the ‘Sixth Sense’ device is compatible with multi-touch and multi-user operations.

Fig 1: Blockdiagram Of Sixth Sense Gadget
2.1 Hardware Component[6]
The Sixth Sense Gadget consists of hardware components like a Laptop, a wearable camera and pico projector as like a pendant, color markers and a mirror.

2.1.1 Laptop:[7]
A laptop basically acts as a computing device. It process the image feed received from the camera. Video stream data captured by the camera is processed by the software program. The program tracks the locations of the visual tracking colour markers at the tip of the user’s mitts using the computer-vision techniques. As the Laptop is web enabled it may also search the web and construe the hand gestures.

2.1.2 Camera:
The camera recognizes and tracks the user’s mitt gestures along with physical objects around it by using computer vision based techniques. In short we can say that the camera acts as a digital eye to the Gadget, which connects the gadget to the world of digital information.

2.1.3 Projector:
The projector requires different interfaces like walls, surfaces and physical objects around us to projects the visual information. The projector consists of a battery which is intrinsic and has about 3 hours of life. A pico LED projector projects the data acquired from the laptop on any surface in view i.e. object, wall or person.

2.1.4 Colour Markers:
The colour markers also called as fiducials are worn by the user at the finger tips. There are different types of coloured markers like red, green, yellow as well as blue. These different colour tapes help the webcam to acknowledge the motion of the hand i.e. gestures. The apparent motion and arrangements of colour markers are translated into gestures that can act as interaction pedagogy for the projected interface applications. The maximum number of fingers tracked is constrained merely by the number of unique fiducials. This enables the Sixth Sense gadget with a multi-user and multi-functionality operation.

2.1.5 Mirror:
The mirror may seem as a surprise component in the composition of the Sixth Sense gadget. But, the utilization of the mirror is extremely important, since the projector is oriented downwards from the neck. The image is reflected by the mirror on to the appropriate desired surface. Thus the digital image is relieved from its confinement and placed in the physical world.

2.2 Software Used [8]
The software works on the principles of computer vision. A small camera acts as an eye thereby connecting us to the world of digital information. Processing is performed within the laptop and the working is based on computer vision algorithms. The platform used is OpenCV and scripted in python language.

Python alms us with lots of user friendly modules and can be easily be interfaced with the computer vision algorithm using Python API of OpenCV

2.2.1 Kinds of Gestures Recognized[9]
Multi-touch gestures are akin to the ones we see in smart phones where we touch the screen and make the map move or even zoom in or zoom out by simply pinching and dragging.

Freehand gestures are similar to clicking a snap or a Namaste gesture so as to start the projection on the surface up ahead.

Iconic gestures are analogous to drawing an icon in the air.

III. IMPLEMENTATION
The Sixth Sense Gadget implementation takes place in following stages:

3.1 Qrcode Detection
To start with implementation of sixth sense device, the location or coordinates of the projector output from the entire camera input need to be extracted out.
Hence we need to initialize the coordinates of the projector frame which is enabled by the QRCodes. In this phase, we project the QRCodes which gets detected easily using python module zbar. It also returns the coordinate of the extreme corners which serves our need to locate the projector frame thereon.

3.2 Marker Tracking
The most important phase in Sixth Sense Gadget is robust hand tracking. This phase is made possible using tracking of colored markers worn around the finger-tip. Initially we fix the color marker depending upon their specific properties [10] (like hue saturation value parameters) each time before changing the markers. This makes the tracking highly robust. To improve upon our efficiency we introduced background subtraction which removes the error caused by same colored static objects in background with respect to relatively mobile colored markers.

V. RESULTS

Table 1. Analysis of the QRCodes Detection

<table>
<thead>
<tr>
<th>QRCODE DETECTION EFFICIENCY</th>
<th>Average Time Taken to Detect</th>
<th>Distance of camera from QRCodes</th>
<th>QRCodes Diagonal Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 sec</td>
<td>50cm</td>
<td>7cm</td>
</tr>
</tbody>
</table>

Table 2. Analysis of the Tracking efficiency

<table>
<thead>
<tr>
<th>Objects</th>
<th>User-friendly</th>
<th>Accuracy of Tracking</th>
<th>Robustness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marker</td>
<td>10</td>
<td>4</td>
<td>3.5</td>
</tr>
</tbody>
</table>

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CONCLUSIONS

The Sixth Sense Gadget is a pendant-like device which acts as an interface by which the pixels from the digital devices can be brought into the physical world. The five senses are unable to provide us all the relevant information and hence is need of Sixth Sense Gadget. The Gadget is a user friendly and attractive interface which even a layman can use easily. Though the Gadget is a little costly the scope of its improvement and the range as well as utility of its application is very wide. The efficiency and of QRCodes and gesture recognition techniques can be improved further and the Gadget can thus become an integral part of every one’s life.

REFERENCES
