Projection Based HCI (Human Computer Interface) System using Image Processing

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Abstract

We use camera attach to the projector to locate a frame shape marker embedded in the large image. Interactive public displays give access as an innovative media to promote enhanced communication between people and information. In this project, we proposed idea to implement contents with interaction elements for vision-based digital public display. Virtual object, laser point detection and projection installation are applied for attracting attention from user. Preliminary study showed positive feedback of interactive content designing towards the public display. This project enables an effective low cost touch interface utilizing only a single camera and a projector. It embeds a small shape in the image generated by the user application (e.g. a touch screen menu with icons) and detects touch by measuring the geometrical distortion in the camera captured image.

Keywords- Interactive, Direct-Touch Surface, Orientation Aware Interface, Human Computer Interface

I. INTRODUCTION

Since the computer had been invented, Human-Computer Interaction(HCI) Technology is being developing since then first comes the mechanical keyboard, Then mouse after that track ball then touch screen technology comes in market and still this technology is developing. Now a day this technology is affecting our day-to-day life since it affecting this amount on our life so we decided to have some new thing for developing this technology further for the future.

In this project, we are introducing some new algorithm and its implementation thus we have taken reference from the professor, researcher who had been working on this project before us.

II. METHODOLOGY AND IMPLEMENTATION

In this Chapter we are going to see about various types of methods of system architectures and Algorithm to achieve this project's specification. In this chapter we are going to discuss about various system architecture it's benefit and different Algorithm For laser points detection.

A. System Architecture

Model of this project will be box shaped in which all hardware component are fitted carefully such that we gate high efficient working system. This box does not allow enter the external light inside the box. All the system work on the projector light and infrared light flows through the acrylic glass.

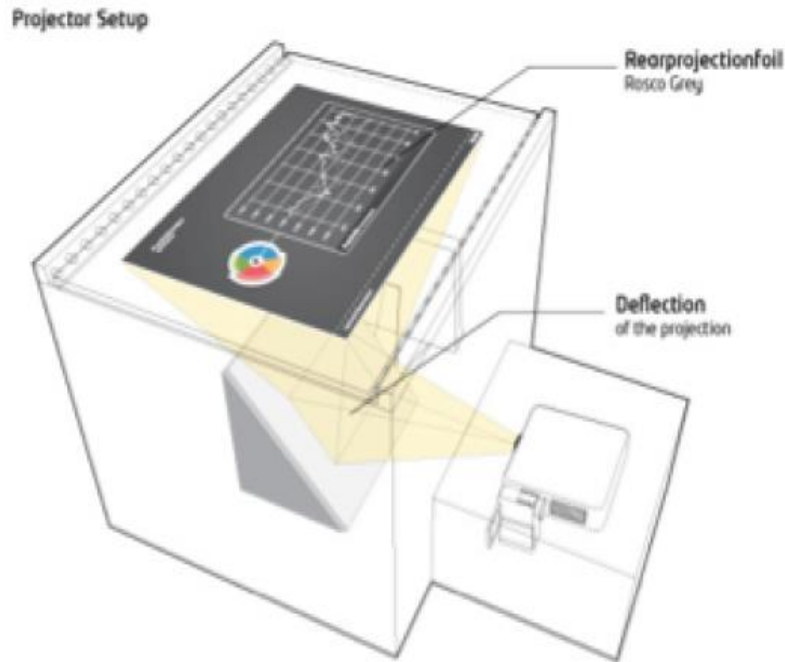### B. Position of Projector in Model

Fig. 1: Position of Projector in model

III. PROJECT DESIGN-MODULE

In this project, there are various type of the input, output and processing devices are used. Each hardware component has it own work and process in this project. Some of them as given bellow.

A. Hardware

1) Amkette Trueview Camera

A digital camera is a camera that encodes digital images and videos digitally and stores them for later reproduction. Most cameras sold today are digital, and digital cameras are incorporated into many devices ranging from PDAs and mobile phones to vehicles. Digital and film cameras share an optical system, typically using a lens with a variable diaphragm to focus light onto an image pickup device. The diaphragm and shutter admit the correct amount of light to the imager, just as with film but the image pickup device is electronic rather than chemical. However, unlike film cameras, digital cameras can display images on a screen immediately after being recorded, and store and delete images from memory.

2) Projector OMANI M9000

A projector or image projector is an optical device that projects an image (or moving images) onto a surface, commonly a projection screen.

Most projectors create an image by shining a light through a small transparent lens, but some newer types of projectors can project the image directly, by using laser points. A virtual retinal display, or retinal projector, is a projector that projects an image directly on the retina instead of using an external projection screen.

B. Software

1) MATLAB

MATLAB (matrix laboratory) is a multi-paradigm numerical computing environment and fourth-generation programming language. Developed by Math Works, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, and FORTRAN. MATLAB has vast number of toolboxes used in various field as per the requirement of application, for this project we mainly used following toolboxes.

2) Block Diagram

The following diagram shows the block diagram of Projection Based 2-Way Interaction with The Operating System Using MATLAB
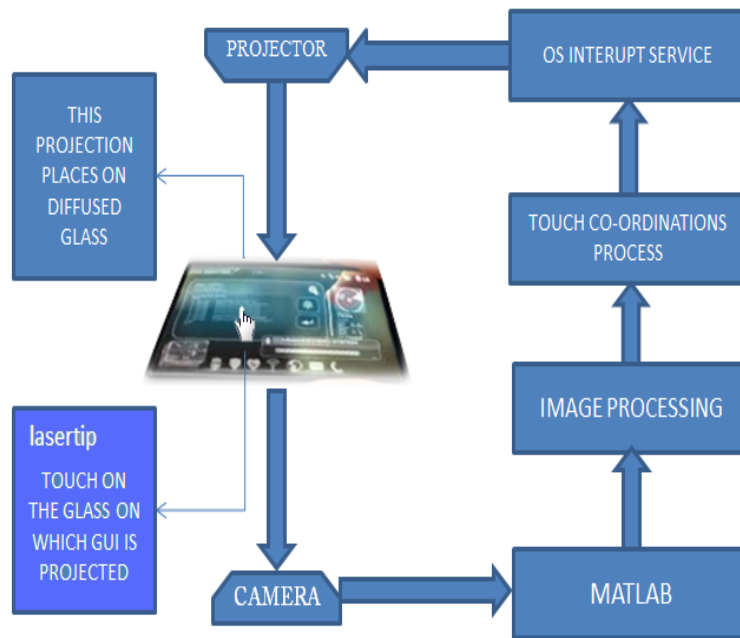
Fig. 2: Working of HCI system

The above block diagram shows how this HCI system works and how data and interrupt controls passes though system.

C. Input/output Section

1) Projection Glass
This glass is specially designed for the projection window. This glass have special diffusing characteristics such that it can illuminate itself when the projection rays coming from the projector and visualize whole GUI screen on the piece of diffused glass.

2) Projector
In this project, the projector act as output device. It plays important role in this project. It project the Application GUI on the piece of diffused glass.

3) Camera
Camera act as input sensor which takes continuous input from the physical world . It take the number of snapshot per second and transfer image data toward image processing section.

D. Image Processing Section
This software act as environment to implement the image processing algorithm in very simple manner.

1) Image processing Algorithm
This block consists of different type algorithmic function to detect the laser point in continuous frame. Good algorithm gives the effective program runs and reduction in program length.

2) Touch Co-ordinates Processing
After detecting laser tips in the input frame from camera this block find out which key or link is selected.

3) Operating System Interrupt
After detecting which key is pressed this block pass the associated interrupt or set of instruction s to the operating system such that required application or program should run at the output.
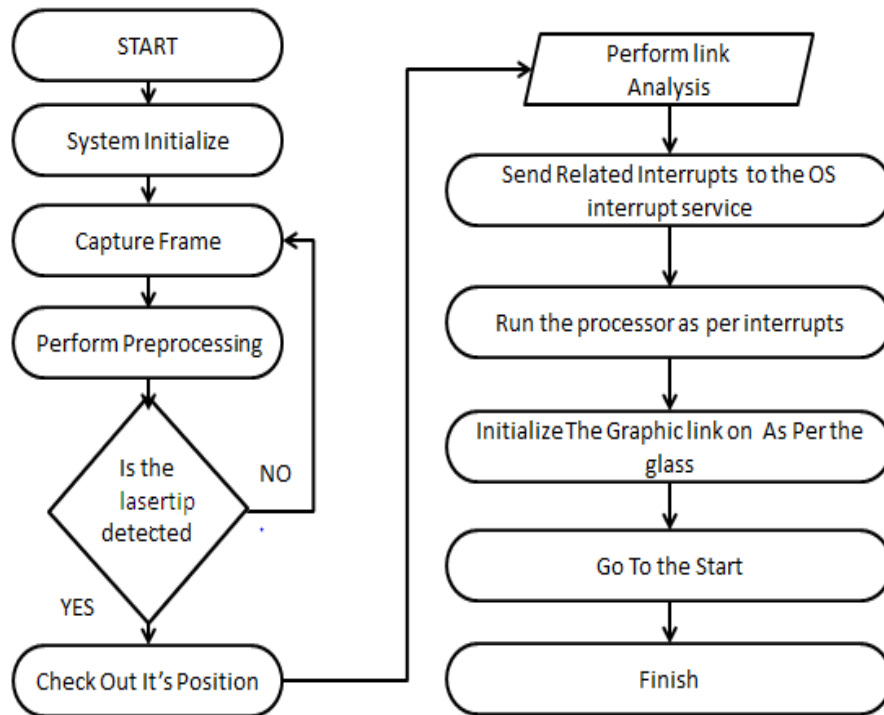
IV. FLOWCHART & ALGORITHM

Fig. 3: Flow Chart & Algorithm

A. Algorithm
1) System Initialization
2) Capture Frame
3) Perform Preprocessing
4) Detect laser points
5) After the laser point detection
6) Perform Link analysis
7) Initialize projection on Acrylic glass
8) Stop.

B. Description
1) System Initialization

At this step, the entire component will be start. System will check the entire component for its status. If any component fails then system correct that error or notify the user about component failure.

2) Capture Frame

At this stage camera takes the Snapshot of the Application GUI which projected on Acrylic glass. Camera takes the snapshot and transmit it to the System to process using MATLAB Software.

3) Perform Preprocessing

Image we got from the last stage does not have that many details in the captured frame so we have to perform preprocessing operation on the captured frame so that we get some details about the laser point's detection. At this stage we perform following operation on the captured frame, to get detail output
− Contrast Stretching
− Segmentation

4) Detect Laser Points

After preprocessing detail in the frame enhance to the greater extent, we have to find out if laser points are detected on frame. For that purpose we use the High Pass Filtering Method. It is technique to find out there is laser points in the frame or not.

5) After The Laser Point Detection

After previous stage if there is no sign of laser points detection then camera initialize itself for new frame take the new snapshot from the Model Environment, There are different methodologies to find out pixel position in image frame, So using that algorithm we have to find out laser point's touch position, and output of this stage will be shown as bellow.
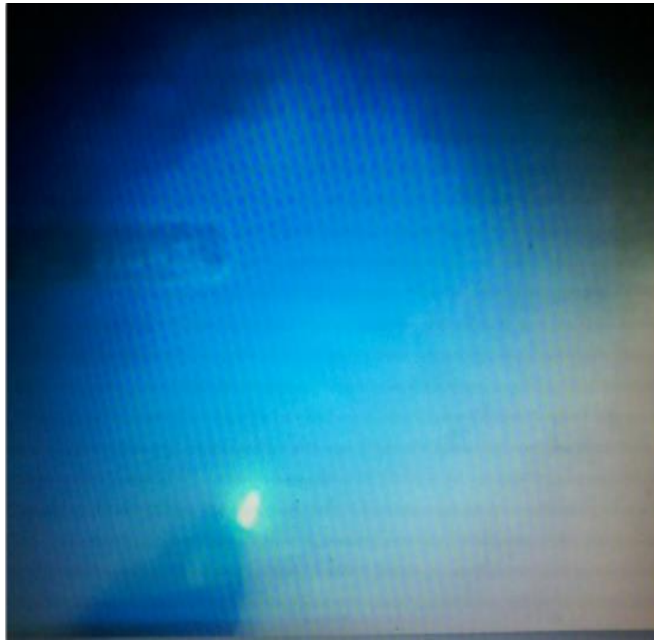
Fig. 4: After the laser point detection

6) Perform Link Analysis

After getting the position of laser points touch we have get information about which type link user has been selected, what interrupt should be generated through this touch-coordination, so that we get maximum output efficiency from the proposed system .

7) Initialize Projection on Acrylic Glass

After executing interrupt service routine   program as per the Laser points touch System should give the satisfied output at the acrylic glass and So that the interaction of Laser points with glass should be real time or say fast.

8) Stop

ACKNOWLEDGEMENT

V. CONCLUSION

We have to apply this algorithm on various direct-touch surfaces to serve their own applications. These designs and inferences can be useful for interaction with a variety of direct-touch devices that generate laser detection information, either using our general algorithm or other more specialized sensing technologies.

VI. FUTURE SCOPE

As this HCI technology have a wide range of applications, it can be further improved by adding thumb orientation and their controls using the hand gesture. This would make the HCI effective and can be helpful to the people as their personal virtual assistant.

VII. APPLICATIONS

– In institution
– As tablet PC/PC
– Industry application
– As a notice board
– At railway platform

Fig. 5: Application

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