



# INTERACTIVE PROJECTOR SCREEN

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**Abstract—** Consider the situation you want to open some folder when you are doing a presentation and you are not able to go to your computer to do the same. Here comes the necessity of our technology. You can touch on the projected screen with your bare hands to do whatever you need to do. You need not go to your computer to do anything during the presentation. If the projected screen is so large or is at some height so that you cannot touch it, then you can use a laser pen. Point your laser pen to wherever you want to click and the corresponding action will be executed.

**Keywords—** Projector Screen, Touch, Laser

## I. 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.

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. The rest of the paper is organized as follows. Proposed algorithms are explained in section II. Concluding remarks are given in section III.

## II. PROPOSED ALGORITHM

In these days, the use of projector for presentations is a very common practice. But projecting the monitor on to a wall or a plain surface has lot of limitations. Consider the situation in which the presenter has to open a folder, image or any other file while taking the presentation. In the present scenario, he/she has to go to the computer and do whatever required. But what if he can control the pc by without going near it!. This is what the project deals with.

The project enables one to control the cursor using hand touch as well as by pointing a laser beam. It also provides facility to click and open the files and folders that need without touching the PC or mouse. It uses the technology of image processing .

### A. Capturing the screen –

Initially, the screen to be controlled is projected on a plain surface. Then, the projected screen is captured by a camera (Even an ordinary one can be used).The captured frames are applied with background subtraction which can distinguish any moving components in the foreground. This processed frame is called masked frame. The system is trained with predefined templates of human hand or the spot caused by laser beam. These templates are searched in the masked frame and if significant match is found, the corresponding coordinate values are taken. Then these coordinates are mapped to fit the size of the large projected screen. Then the mouse pointer is moved to the corresponding coordinate point.

### B. Identifying the click –

A click happens if there is a template match as well as no significant difference in the coordinates. Many researchers have used glove based devices to measure hand location . In general, glove-based devices can measure hand position with high accuracy and speed, but they aren't suitable for some applications because the cables connected to them restrict

hand motion. Some Systems use retro-reflective spheres that can be tracked by infrared cameras. The “SociaDesk” project uses a combination of marker tracking and infrared hand tracking to enable the user interaction with software-based tools at a projection table. The “Perceptive Workbench” system uses an infrared light source mounted on the ceiling. A common approach these days is to use touch sensitive surfaces to detect where the user hands are touching the table, but it is argued that barehanded interfaces enjoy higher flexibility and more natural interaction than Camera Projector Projected Screen On a plane surface. Furthermore, tabletop touch interfaces requires special hardware that is still expensive and not readily accessible to everyone.



Fig. 1. System setup with the projector and the camera.

In this technology we used Python with OpenCV (Open Source Computer Vision developed by Intel) library which has many real-time computer vision functions which can be very useful as well as it processes faster than conventional software like MATLAB, etc. Initially we get live video from Camera which is nothing but sequence of continuous frames of images. Take one frame and perform desired operation. The algorithm proposed contains following steps:

Background subtraction, also known as Foreground Detection, is a technique in the fields of image processing and computer vision wherein an image's foreground is extracted for further processing (object recognition etc.). Generally an image's regions of interest are objects (humans, cars, text etc.) in its foreground. After the stage of image preprocessing (which may include image denoising, post processing like morphology etc.) object localisation is required which may make use of this technique. Background subtraction is a widely used approach for detecting moving objects in videos from static cameras. The rationale in the approach is that of detecting the moving objects from the difference between the current frame and a reference frame, often called “background image”, or “background model”. Background subtraction is mostly done if the image in question is a part of a video stream.

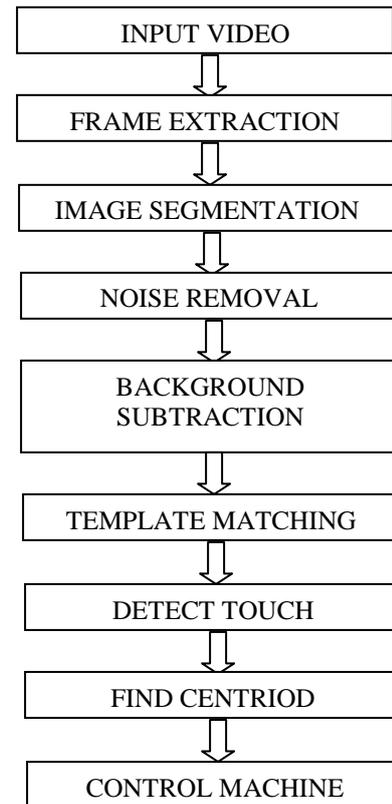


Fig. 2. An Overview of the Proposed HMI Approach

### III. CONCLUSION

The project contains two subparts. At first the finger tip or the laser point is detected from the input of the camera. The camera continuously captures the video of the projected surface. For identifying the finger tip from the camera's input, we use background subtraction. Background subtraction separates dynamic objects from the static background. The finger tip or the laser point will be continuously moving. Thus by doing background subtraction, we can separate out the finger tip.

In the second subpart that is after doing the background subtraction we compare the output of background subtraction with a previously saved template. If it matches, then we find out the position of the matched template. After that we move the mouse pointer to that position. If the mouse position are same for some amount of time, left double click is done.

We developed a system to control a computer using a real-time camera. We implemented mouse tasks such as single and double clicking, and scrolling. This system is based on computer vision Algorithms. From the results, we can conclude that, the system gives excellent results in variety of light conditions. This system could be useful in providing an alternative to existing input devices of mouse and keyboard. In the future, we plan to add more features such as hand gesture



based input. Also to make system more flexible, Natural light or Low and a portable small sized projector (Pico projector) may be used instead of usual large sized one. Furthermore, a system consisting of dedicated projector, camera and a controller unit may make the system more compact.

#### IV. REFERENCE

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