International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 03 | Mar-2018 www.irjet.net p-ISSN: 2395-0072

Real Time Implementation of Air Writing

J. Joy Sharon[1], N. Shazia2, R. Sri Girija[3], B. Binu[4].Mrs.J. Jeneetha Jebanazer[5]

[1234]UG Scholars, Department of Electronics and Communication Engineering, Panimalar Engineering College, Chennai-123.
[5]Associate Professor, Department of Electronics and Communication Engineering, Panimalar Engineering College, Chennai-123.

Abstract—*In this paper, we propose a system which is used in the controlling of machines and other devices in the industries and other areas through hand gestures from a remote place. In the previous year a novel interactive projection system, which enables bare finger touch interaction on regular planar surfaces (e.g., walls, tables), with only one standard camera and one projector. This system has been enhanced using wireless system which enables the user to control the systems in the industries wirelessly. This also helps us to identify which system is on or off. We have included the switching on and off of the systems this can be further enhanced to control the speed of the device and the time until which the device should be on or off and many more things. Whenever a red pointer is brought near the quadrant of the device which is to be switched on or off the device in the industry is switched on if it is switched off and vice-versa. This is processed using mat lab. The colour of the pointer can also be changed based on the requirement of the user.*

Keywords— Gestures, Finger touch interaction, Wireless system

1.INTRODUCTION

In this project, IPS, an interactive projective system, was proposed that was merely composed of a projector and a mono-camera. Touch interaction on a flat surface was supported by the system. To achieve this goal, we explored the finger's influence on the button's distortion and built a model to describe the button's distortion. We found that there was a significant positive correlation between the button's distortion and the height of a bare finger. Then a novel, fast, and robust approach was proposed to detect the touch action on the surface. It was performed in three stages: 1) mapping by homography and extracting region of interest, 2) distortion detection, and 3) touch judgment. Meanwhile, the button's distortion detection, which was similar to Canny edge detection, was robust to the shadows and finger's edge, by comparing the detected edge direction with the button edge's direction. Additionally, the touch detection algorithm was processed on the ROI, so the computation complexity.

2. RELATED WORKS

Compared to multiple spots in Human-Machine interaction using the projection screen and light spots from multiple laser pointers (HMPS), most works focus on single spot location. In the paper from Georgia Tech [8], a monochrome camera with a narrow-band, green filter matched to the frequency of green laser pointers responds strongly to the incoming green light while drastically reduces other incoming light. Thus, the location of the pixel with the maximum value above a fixed threshold is obtained. Additionally, two papers [9], [10] present a new method upon the neural network to distinguish the patches to judge whether any patches contain a spot or not. Before recognition, the whole background patches without a laser spot are sent for training. If a new patch has a spot, the neural network will generate a distinct value. Based on that this spot could be identified. Another way used by Widodo and Matsumaru [11], in which the spot is extracted from the foreground of frames seized by a camera since the vibration of user's hand exists. Though this method asks for a static background, we can obtain the binary image of the spot which has nothing to do with the background color. Then Chavez and Femandez [12] consider a hybrid technique consisting of Template Matching (TM) and Fuzzy Rule Based Systems (FRBSs), which is applied to complete images to extract a candidate image section and the FRBS will determine if the proposed section is a laser spot image. Although there are abundant pathways to know the information about the spot, yet these single spot location methods mentioned above are considerably difficult to extend in HMPS directly on account of distinguishing multiple spots.

At the early stage of development of similar systems to HMPS, there are several techniques, however, with defections more or less. Computer Graphics Laboratory of Stanford University have attempted to design a multi-user laser-based interaction on large tiled displays [4]. To begin with, they locate the laser spot by a threshold of brightness, which is the same as the way mentioned previously [8]. Secondly, a separate Kalman Filter for each laser pointer is created to predict the trajectory of the spot based on the observed location of the spot. Last but not least, whether a spot belongs to that trajectory or not is determined by checking whether the observed point lies within an elliptical region around each predicted point or not. The technique above works well in practice, however, not perfectly. A large acceleration makes the actual observed value far from the prediction. Another difficulty arises when several laser pointers encounter with each other nearby. Also, the system mistakes the spot for other ones when these spots are turned on or off or left the screen. On the contrary, our approach avoids the three problems above considerably although it is limited by the fast stroke, which could be solved easily by just improving the frame rate of the camera. In the papers [13], [14], they describe a novel technique for tracking and identifying multiple laser pointers synchronously. The basic idea of tracking multiple laser spots is to use prediction and to assign the laser spot that is closest to each predicted position to the corresponding laser pointer, which has been applied in

(a) (b)

Fig. 1. Three types of laser pointers (a) color image (b) binary image[4]. Following that, a series of circuits are needed for the laser spot to communicate with the computer, which increases the cost largely.

Our main contribution in this paper is a new hybrid technique which combines the single laser spot location with BPNN. This method is established on a simple hardware system just including a web camera, which reduces the cost by a wide margin. What's more, it makes the discrimination when the spots stay near each other come true and it still works well no matter which laser spot is turned on or off or left the screen.

3.PROPOSED SYSTEM

3.1 BLOCK DIAGRAM

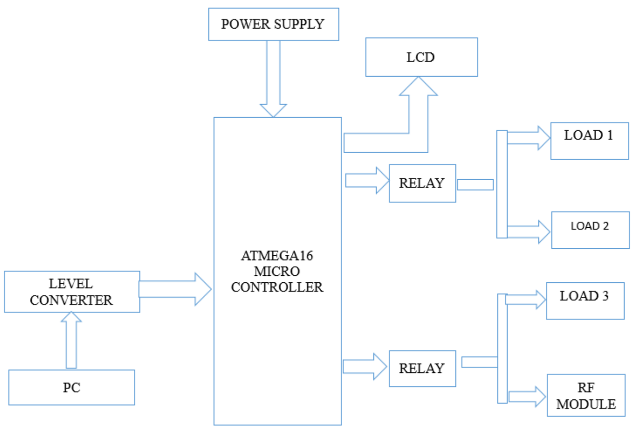

Fig.2.1

- In Fig.2.1, We are using an ATMEGA-16 Micro Controller, this acts as the heart of the circuit.
- There is a common power supply for the circuit which is 5V which has been stepped down from 230V in the power supply circuit which contains a Bridge rectifier.
- We use a level convertor (max 232), which supports serial communication link the hardware to the camera which is going to be used via Personal Computer.
- From the Micro controller the LCD is connected for indication purpose.
- Relay Driver (ULN 2003A) is used to drive the load with the logic has been established in the driver circuit.
- For the RF Module we use ht12 e/d module which supports this Wireless transmission in single or half duplex mode with a frequency of 433MHz.

The schematics of the proposed system has been explained in the Fig.2.2.

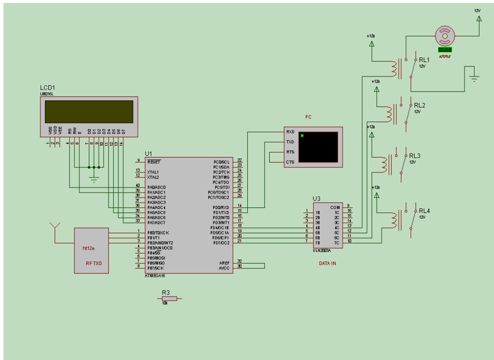

Fig. 2.2 Schematics of the proposed system

3.2 WORKING PRINCIPLE

This project presents an alternative approach to detect touch operation with only one standard camera. It can be used in most non-glare environments (e.g., indoors or an outdoor environment without sunlight). The conceptual sketch of the system. In general, most of the mobile phones in the commercial market integrated at least one camera that can be adopted to detect touch action by our strategy. Comparing with the traditional systems mentioned above, the proposed scheme offers low cost and low power consumption without other additional devices such as the depth camera. As we know, one projector and one camera make up a 3-D measurement system. In this field, structured light, which achieves 3-D reconstruction by analyzing a feedback image of a certain pattern projected on the object, is one of the most promising techniques, but the computational complexity of 3-D reconstruction is high, which will greatly influence the real-time capability of the system. Therefore, we propose a novel approach that takes advantage of the buttons' distortions caused by the fingers to detect the touch operation on the screen. For example, if a button is clicked by the finger, then the shape of the button will change in the camera's image plane (CIP). Furthermore, we explore the model of the buttons' deformation caused by the finger, which shows that there is a positive relation between the button's distortion and the finger's height to the projected surface. Then the touch information of the finger can be extracted from the button's distortion. Instead of tracking the hand's 2-D position, which is also recognized as a challenging work in computer vision, we focus on detecting the deformation of the buttons to determine the touch action on the projected surface.

4. ADVANCEMENT IN THE PROJECT

- RF module included as the load unlike the previous system.
- Relay drivers are reduced.

5. BENEFITS OF THE SYSTEM

- *Accuracy*:

Since the hardware supported for the system is already programmed, there is mere chance of interference.

- *Remote management*:

Distant handling of the devices is possible with this system without dependence of physical operation.

- *Power saving*:

It can save power due to simple circuitry.

6. CONCLUSION

In this project, IPS, an interactive projective system, was proposed that was merely composed of a projector and a mono-camera. Touch interaction on a flat surface was supported by the system. To achieve this goal, we explored the finger's influence on the button's distortion and built a model to describe the button's distortion. We found that there was a significant positive correlation between the button's distortion and the height of a bare finger. Then a novel, fast, and robust approach was proposed to detect the touch action on the surface. It was performed in three stages: 1) mapping by homograph and extracting region of interest, 2) distortion detection, and 3) touch judgment. Meanwhile, the button's distortion detection, which was similar to canny edge detection, was robust to the shadows and finger's edge, by comparing the detected edge direction with the button edge's direction. Additionally, the touch detection algorithm was processed on the ROI, so the computation complexity was low, which ensured the real time property of the touch detection. Above all, to demonstrate the feasibility of the method, a hardware prototype of IPS was presented. Several typical applications were set up and experiments on the virtual keyboard have shown that the accuracy of the touch detection reached 96.9% at the 40-cm projected distance, which was high enough for most button-based applications. In the future, we will take advantage of the other graphic features (e.g., character shape, icon feature) in the human–computer interface to detect touch events on the projected screen.

REFERENCES:

[1] G. Eason, B. Noble, and I.N. Sneddon, "On certain integrals of Lipschitz-Hankel type involving products of Bessel functions," Phil. Trans. Roy. Soc. London, vol. A247, pp. 529-551, April 1955.

[2] J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68-73.

[3] A. Hansson, K. Goossens, M. Bekooij, and J. Huisken, "CoMPSoC: A template for composable and predictable multi-processor system on chips," ACM Transactions on Design Automation of Electronic Systems, vol. 14, no. 1, pp. 1-24, 2009.

[4] X.Zhang, Z. C. Ye, L. W. Jin, Z. Y. Feng, S. J. Xu, "A New Writing Experience: Finger Writing in the Air Using a Kinect Sensor", IEEE Multimedia, pp. 85-93, 2013.

[5] F.-A. Huang, Chung-Yen Su, Tsai-Te Chu, "Kinect-Based Bid-Air Handwritten Digit Recognition using Multiple Segments and Scaled Coding", IEEE International Symposium on Intelligent Signal Processing and Communications Systems, pp. 694-697, Nov. 2013.

[6] S. Belongie, J. Malik, J. Puzicha, "Shape matching and object recognition using shape contexts", IEEE Transactions on Pattern Recognition and Machine Intelligence, vol. 24, no. 4, pp. 509-522, April 2002.

[7] T.-T. Chu, C.-Y. Su, "A Kinect-Based Handwritten Digit Recognition for TV Remote Controller", IEEE International Symposium on Intelligent Signal Processing and Communications Systems, pp. 414-419, 2012.

[8] C. C. Kemp, C. D. Kemp, H. Nguyen, J. B. Trevor, Z. Xu, "A Point-and-Click Interface for the Real World: Laser Designation of Objects for Mobile Manipulation", 3rd ACM/IEEE International Conference on Human-Robot Interacton, pp. 241-248, 2008.

[9] C. Jung, S. Ban, S. Jeong, "Input and Output Mapping Sensitive Auto-Associative Multilayer Perceptron for Computer Interface System Based on Image Processing of Laser Pointer Spot", Lecture Notes in Computer Science, vol. 6444, pp. 185-192, 2010.

[10] C. Jung, M. Lee, "Laser Spot Pattern Recognition Based Computer Interface Using I/O Mapping Sensitive Neural Networks", IEEE International Conference on Consumer Electronics, pp. 847-848, 2011.

[11] R. B. Widodo, Weijen Chen, T. Matsumaru, "Interaction Using the Projector Screen and Spot-light from a Laser Pointer: Handling Some Fundamentals Requirements",

Proceedings of SICE Annual Conference, pp. 1392-1397, 2012.

[12] F. Chavez, F. Fernandez, R. Alcala, J. Alcala-Fdez, and F. Herrera, "Hybrid laser pointer detection algorithm based on template matching and fuzzy rule-based systems for domotic control in real home environments", Applied Intelligence, vol. 36, issue. 2, pp. 407-423, March, 2012.

[13] J. Y. Oh, W. Stuerzlinger, "Laser Pointers as Collaborative Pointing", Graphics Interface. pp. 141-149, 2002.

[14] F. Vogt, J. Wong, S. Fels, and D. Cavens, "Tracking Multiple Laser Pointers for large Screen Interaction", Extended Abstracts of the ACM Symposium on User Interface Software and Technology (UIST2003), pp. 95-96, 2003.