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Implementation of Intelligent Access System Using Virtualization

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Abstract: Implementation of Intelligent Access System using Virtualization is a Project based on upcoming Futuristic Technology. Virtualization is the act of creating virtual version of hardware called virtual machine using software called Hypervisor. A standard camera can be used to capture the virtual screen. We use MATLAB program for air touch recognition which is detected by using matrix & pixel recognition and control the device using ATMEGA16 microcontroller, which is programmed using BASIC language using BASCOM AVR COMPILER. Our Intelligent Access System recognizes the character or switch then pass the String to the microcontroller which receives the character and control the device depends on gesture recognize.

Keywords: Virtualization, Access, Microcontroller, Pixel, Atmega, Innovative, Communication.

I. INTRODUCTION

There are various ways of accessing devices, but we have tried an innovative way of accessing the devices through hand gesture or pointing object, by recognizing some unique color. Our project is aimed at preventing electrical shocks occurring due to operating electrical switches. For embedded detection and recognition, a smaller writing space, e.g., in front of a webcamera is assumed as an area consisting of four quadrants.

Motion gestures provide a complimentary modality for general human–computer interaction. Motion gestures are meant to be simple so that a user can easily memorize and perform them. However, motion gestures themselves are not expressive enough to input text for motion-based control.

We write letters or words with hand or finger movements in a free space. It is especially useful for user interfaces that do not allow the user to type on a keyboard or write on a trackpad/ touchscreen, or for text input for smart system control, isolated letters written in the air involve a sequence of hand or finger movements. Although any snapshot of such movements can be considered a realization of a motion gesture, it is more complicated than gesture recognition because of the interdependence among the involved "gestures."

II. RELATED WORK

Traditional Methods

- Traditional handwriting styles include recursive or print letters.
- These writing styles vary with writers and are often mixed in actual handwriting.
- To make it easier for a machine to recognize and quicker for a user to write, letters are simplified into single-stroke styles.

Vision-Based Approach

- **Jin et al.** proposed a vision-based approach for finger-writing character recognition.
- **Schick et al.** also proposed a vision-based hand tracking system that recognizes handwriting in mid-air. finger writing in the air is tracked with a depth sensor.
- Different motion sensing and tracking technologies impose various load on user.

Hidden Markov Models

- Hidden Markov models (HMMs) are widely used for online hand writing recognition ligature models are proposed to address online recognition of cursive handwriting,
- Successive letters are connected without explicit pen-up moves. Motion-based handwriting can also be considered in parallel to motion gestures or sign language.

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- Motion gesture recognition has been studied with different types of motion tracking devices. Sign language is more sophisticated than motion gestures.

Data Gloves Approach

Wearing data gloves is often considered by many users as an undesirable burden and may change the wearing user's motion behavior. In our earlier work, we opt for a hybrid tracking system and the accompanying device that is simple to control and convenient to use.

Symmetric Transformation

Another look at the row and column operations in above equation reveals that these operations are functionally identical. Such a transformation is called a symmetric transformation. A separable and symmetric transform can be expressed.

Hand Gesture Approach

- Most existing online handwriting recognition techniques depend on a pen up/pen down gesture to window the input data.
- Essentially, there is a known beginning and end to user input.
- We are using an input device that constantly streams the location of the fingers within its field of view so the pen up/down gesture is not as easily identified.

Hilbert Warping

Hilbert Warping has been proposed as an alignment method for handwriting recognition. Other scenarios have been proposed, including one where an LED pen is tracked in the air.

III. TOOLS REQUIRED

Hardware Requirement

- Power Circuit
- Microcontroller Unit
- Driver Circuit
- Level Converter
- Display Unit
- Image Processing Unit

Components Used

- ATMEGA 16
- ULN 2003
- MAX 232
- Web Camera
- Laptop
- Relay
- Lamps
- USB To Serial Converter
- Power Supply

Software Requirement

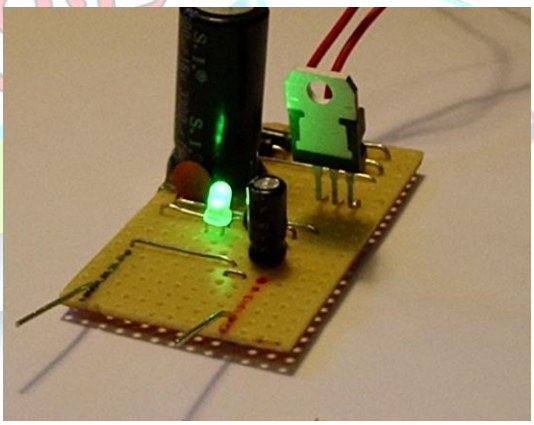
- BASCOM AVR Compiler
- Pony Prog Software
- Proteus Simulator
- MATLAB

IV. INTELLIGENT ACCESS SYSTEM

Our Project consists of various Units like Power Supply Unit, Microcontroller Unit, Level Converter Unit, Driver Unit, Display Unit, and Image Processing Unit.

The Power Supply Unit

The Power Supply Unit consists of Step down Transformer to step down the input AC voltage of 230V to 12V. Stepped down Voltage is further connected to Bridge Rectifier which consists of 4 diodes. The Bridge Rectifier converts AC current to DC current. Then the current is fed to a Capacitor of range 1000uF to filter the AC components. Then the current is further fed to the Voltage Regulator namely 7805 IC, which provides a regulated stable voltage of 5V. Regulator is used to regulate fluctuating input & gives constant output. The regulated Voltage is further fed to the Capacitive Filter to remove any remaining Ripples & noises & disturbances.



We also have used LED (Light Emitting Diode) to indicate that the Power Supply is on. We have used a dropping Resistor which acts as a Voltage Limiter to supply a voltage value of 2V to LED & the remaining 3V is dropped across the resistor. Thus we have a Regulated Power Supply of 5V to our Project.

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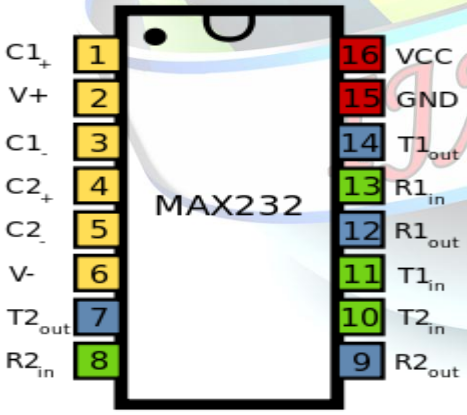
The Microcontroller Unit

Next, we move to the Heart of our Project, "The Microcontroller Unit". We have used ATMEGA 16 microcontroller, which is a low power, high speed & high performance 8 bit Microcontroller from the AVR family. It has a advanced RISC architecture (RISC- Reduced Instruction Set Computer).

It requires only 131 instructions which are mostly executed by a single clock cycle of frequency 16MHz. Piezo Electric Crystal of frequency value 3.86 MHz is used to give a clock cycle frequency to the Microcontroller. It consists of 32 pins divided into 4 ports A, B, C, D, each port consisting of 8 pins which perform dual functions.

The Level Converter Unit

We have used MAX 232 Level Converter. The Laptop can work with RS232 level. It can work with 9V. But our Microcontroller can work with TTL Level (Transistor Transistor Logic) i.e., It can work with 0V & 5V values.



The Level Converter acts as a Voltage Interpreter between Laptop & Microcontroller .We have used Four Capacitors which acts as Voltage Double.

Usb To Serial Converter

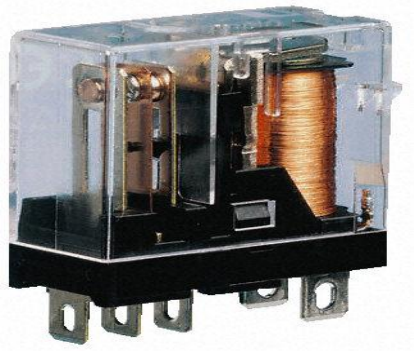
Then we have used USB to Serial Converter to connect the Laptop & Microcontroller through the Level Converter. Laptop can support only USB port & our Level Converter uses Serial Port. Hence to connect these ports, we have used the USB to Serial Converter.

The Display Unit

We have used 2*16 LCD (Liquid Crystal Display), consisting of 2 rows & can display 16 bits in a row, to diplay our output for our Convenience. We also have used the Preset to adjust the contrast & brightness of Liquid Crystal Display.

- A 16x2 LCD means it can display 16 characters per line and there are 2 such lines.
- In this LCD each character is displayed in 5x7 pixel matrix.
- This LCD has two registers, namely, Command and Data.
- The command register stores the command instructions given to the LCD.
- The data register stores the data to be displayed on the LCD.

The Relay Unit



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Relay is an electromechanical switch used to control AC loads. It provides isolation between Microcontroller & the loads. Microcontroller can provide only on/off signal to the relays & doesn't have enough current sourcing ability to drive voltage. Hence, Relay driver circuit is used to drive the relay & access and control the electronic components.

The Driver Unit

The Relay Driver consists of the ULN 2003 which is a high voltage (50V) & high current (500mA) integrated IC , that can operate at a peak current of 600mAWhen pin 1 of ULN2003 is provided high input from ATMEGA 16, pin 12 goes to the ground & current flows in the relay which will makes it move from NC (Not Close) to the NO (Not Open).

Compiler

We have programmed the Microcontroller using BASCOM AVR Compiler, which takes the high level language BASIC code & creates a HEX format file which can be uploaded into ATMEGA 16 using the PONYPROG software & cables. ATMEGA16 executes the code written in BASIC language.

Digital Image Processing

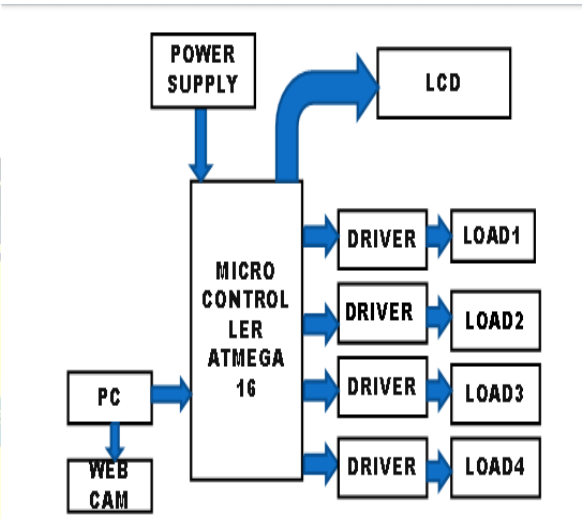
MATLAB software is being used for Digital Image Processing Unit. We have written certain code in Matlab that will help to get the image according to pixels which has been captured by the Webcam & it can sense the finger gesture which is used to control the devices.

The application is built around the Matlab scripting language. We use the Command Window as an interactive mathematical shell or executing text files containing code.

Matlab matrix laboratory is a multi-paradigm numerical computing environment and fourth-generation programming language. A proprietary programming language developed by MathWorks, Matlab allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages.We have written certain code in Matlab that will help to get the image according to pixels which has been captured by the Webcam

When we run the program, our output consists of two windows. First Figure consists of a Win video, an inbuilt software of the Webcam, captured by the camera. The Second Figure consists of three screen views of the image captured by the camera. The first Screen consists of 2*2 matrix window which is divided into 4 quadrants. The Second screen Reobject detection window has the original image & exact capture unit. Hence when our project senses the position of finger in any 1 of the 4 quadrants, the corresponding value is sent to the ATMEGA16 from the laptop through the USB to serial converter & thus we can control the devices.

V. BLOCK DIAGRAM



VI. ADVANTAGES

- New Innovative Upcoming Futuristic Technology
- Prevents the Electrical Shocks Problems
- Easily Portable
- Useful for children & Elderly People
- It promises a Bright Future for the Upcoming Generations

VII. OUTPUT

There are various ways of accessing devices, but we have tried an innovative way of accessing the devices through hand gesture or pointing object, by recognizing some unique color. Our project is aimed at preventing electrical shocks occurring due to operating electrical switches. For embedded detection and recognition, a smaller writing space, e.g., in front of a webcamera is assumed as an area consisting of four quadrants.

We have written certain code in MATLAB that will help to get the image according to pixels which has been captured by the Webcam & it can sense the finger or object which is used to control the devices.

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VIII. CONCLUSION

In this study, we attempt to recognize the gesture in air based upon the colour of the object used & recognize it using matrix & pixel recognition & the space in which gesture is made is imagined to be a square consisting of four quadrants , each corresponding to one device & thus the four devices can be controlled by using virtual switches, i.e., switches are actually not present, but we just assume air as switch & we write in air & our gesture is recognized & the device can be switched on / off.

The microcontroller which is already being programmed regarding which string corresponds to which device ,will now control the device through the relay, based upon the string received & thus our new innovative project , which is an upcoming futuristic technology , "Intelligent Access system using Virtualization" has been implemented very clearly and successfully.

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