

A Novel Approach for Operating Electrical Appliances Using Hand Gesture Recognition

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Abstract: Vision-based automatic hand gesture acknowledgement has been a very active research theme in recent years with inspiring applications such as human computer interaction (HCI), electronics device command, and signal language understanding. Hand sign recognition is presented through a curvature space procedure in which finding the boundary contours of the hand are engaged. This is a robust approach that is scale, translation and rotation invariant on the hand poses yet it is computationally demanding. A method for signal acknowledgement for signal language understanding has been proposed in computer vision. Human interaction involves various hand processing task like hand detection, recognition and hand tracking. This technology mainly focuses on the needs of physically challenged group of people and helps them to operate just by showing hand gestures. Thus, our project is aimed at making a system that could recognized human gesture through computer vision.

Keywords: Human computer interaction, curvature space procedure.

I. INTRODUCTION

Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gestures via mathematical algorithms. Gestures can originate from any bodily motion or state but commonly originate from the face or hand. Many approaches have been made using cameras and computer vision algorithms to interpret sign language. However, the identification and recognition of posture and human behaviors is also the subject of gesture recognition techniques. Gesture recognition enables humans to communicate with the machine (HMI) and interact naturally without any mechanical devices. Using the concept of gesture recognition, it is possible to point a finger at the computer screen so that the desired electrical appliances will operate accordingly. This could potentially make conventional input devices such as mouse, keyboards and even touch-screens redundant.

The project mainly focuses on physically challenged group of people who were usually out off the big companies' scope and as the enters home he/she knows the exact location of the switch but, still is enable to operate it. They depend on other people to operate the devices. This prompted the interest to operate the electronic devices by just showing hand gestures.

II. BLOCK DIAGRAM

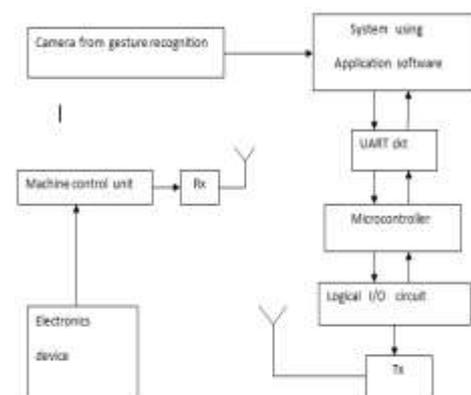


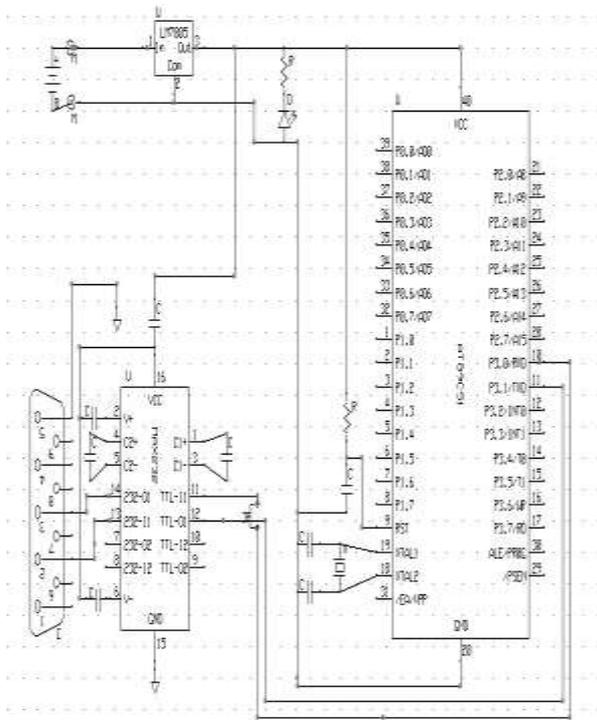
Fig : Block Diagram

2.1 Description:

As shown in the above block diagram, hand gestures/signs are captured by the camera. Then through system using application software block sign is converted into command/text. The ZigBee RF Modules are interface to a host device like microcontrollers through a logic-level asynchronous serial port. Through its serial port the module can communicate with any logic and voltage compatible UART or through a level translator to any serial device (for example: through a RS-232 or USB interface board).when data is send to microcontroller through UART circuit.

Microcontroller decodes the data and sends it to transmitter edge. This data is further received by receiver block and through machine control unit it controls various electronic devices as per command given in this project.

III. WORKING



This project uses 5V dc supply for crane and 230V ac supply for home appliances. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer. The rectified output from bridge rectifier is given to filter circuit. From the regulator the power is supplied to all sections.

As it is wireless and hand gesture interfacing we are doing here for that we decode the data and with the help of zigbee we are initiating it forward. The project is built around the PIC16F micro controller from Microchip. This micro controller provides all the functionality of the display and wireless control. Here the camera reads the sign from the hand and then drive the sign to the scheme. System utilization application converts binary image to gray scale image. The receiver receives the data coming from the transmitter and the same data will be received by the microcontroller at the receiver end. The microcontroller sends this data to the display unit and number of count of fingers are displayed at the transmitter end.

In this way we can command any appliance which is location at a distant location from the transmitter without utilizing keyboard and mouse. The work uses low resolution cam for capturing the hand gestures and an algorithm that

processes the acquired images and then classifies the hand gesture correctly. The work mainly emphasizes from the hand gestures and use that features in the recognition algorithms. Initially, the system will contain a setup procedure, in which, the algorithm is trained based on significant feature extracted for different hand gestures. Once the setup is completed, the system will be able to classify the given hand gesture based on the database knowledge.

IV. HARDWARE DETAILS

Hardware designing process for the project starts with design of the schematic. This project contains the key component like

- Microcontroller.
- ZIGBEE
- Human Interfacing Devices (CAMERA)
- Relays.

4.1 Microcontroller

To work with Zig-Bee devices that work according to different layer is required. Along with Zig-Bee Operations, sensors, their signaling and actuators also forms the essential part of the project. To work on this, entire hardware component and microcontroller should work synchronously. To choose microcontroller, primary thing is to satisfy hardware requirements of the project. From the definitions of stack for Zig-Bee, memory requirement is high. To operate with all peripherals along with timing requirement, it puts timing constraint & speed performance of microcontroller gets affected. As our application is based on consumer appliances it should be cost effective also.

4.2. Zigbee

The ZigBee RF Modules are interface to a host device like microcontrollers through a logic-level asynchronous serial port. Through its serial port the module can communicate with any logic and voltage compatible UART or through a level translator to any serial device (for example: through a RS-232 or USB interface board).

- **Power Supply:**

A power supply is a device that supplies electric power to an electrical load. The term is most commonly applied to electric power converters that convert one form of electrical energy to another though it may also refer to devices that convert another form of energy (mechanical, chemical, solar) to electrical energy. A regulated power supply is one that controls the output voltage or current to a specific value the controlled value is held nearly constant despite variations in either load current or the voltage supplied by the power supply's energy source.

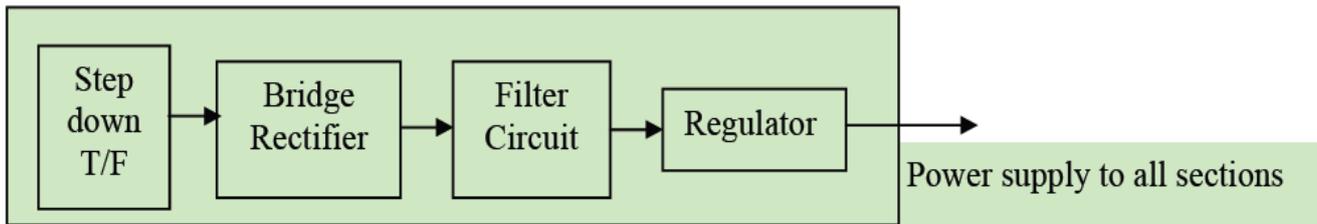


Figure 4.2 Power supply

• **Relay:**

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have double throw (changeover) switch contacts as shown in the diagram.

4.3 Relay Driver Circuit

The following circuit will allow you to drive a 12V relay using logic voltage (an input of 4V or greater will trip the relay). The circuit has its own 12V power supply making it self contained but the power supply portion can be left out if an external supply will be used. The circuit shows an output from the power supply that can be used to power other devices but it should be noted that the supply is unregulated and not particularly powerful with the parts stated. The 12V DC output is suitable for powering a few LEDs or low voltage lights but should not be used to power other electronic boards or motors.

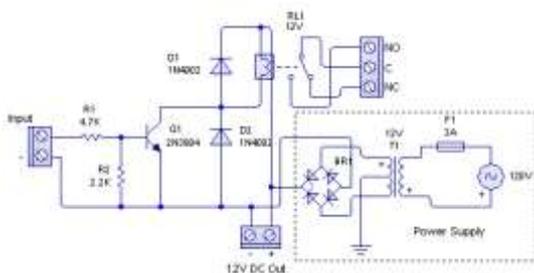


Figure 4.3 Relay driver circuit

V. ADVANTAGES:

1. It reduces the hardware component.
2. Uses of electricity could reduce.
3. Speed and sufficient reliable for recognition system.
4. Good performance system with complex background.
5. Exact shape of the hand obtained led to good feature extraction.

VI. APPLICATIONS:

1. **In Air Traffic Control:** In aircraft traffic controls, this technology can aid in detailing every

part of location information about the airplanes near to the airport.

2. **In Cranes:** In cranes, this can be used instead of remotes so that easy picking and shedding of load can be load at difficult locations.

VII. FUTURE SCOPE

1. Focused on embedded platform implementation of the algorithm on robotic system.
2. In Industrial sector hand gesture recognition technology can be implemented for temperature controlling.
3. This technology can also be used for controlling various functions in car.
4. Various touch screen smart phones are also incorporating this technology to provide easy access.
5. Gesture recognition technology can also be used to make the robots understand the human gestures and make them work accordingly.

VIII. CONCLUSION

We have used a fast and skin detection algorithm for a hand gesture recognition problem. Given observed images of the hand, the algorithm segments the hand region, and then makes an inference on the activity of the fingers involved in the algorithm on real images we have acquired. Based on our motivating robot control application, we have only considered a limited number of gestures. Our algorithm can be extended in a number of ways to recognize a broader set of gestures. The segmentation portion of our algorithm is too simple and would need to be improved if this technique would need to be used in challenging operating conditions. However we should note that the segmentation problem in a general setting is an open research problem itself. Reliable performance of hand gesture recognition techniques in a general setting require dealing with occlusions, temporal tracking for recognizing dynamic gestures, as well as 3D modeling of the hand, which are still mostly beyond the current state of the art. Also the problem of physically challenged person had been solved. Now they too can operate the electronics devices at home and work in

industrial sector just by showing the hand gestures in front of the camera.

REFERENCES

- [1] P. Premaratne and Q. Nguyen, “Consumer electronics control system based on hand gesture moment invariant”, IET Computer Vision, 1(1), 2007, 35-41.
- [2] Silas Wan and Hung T. Nguyen “Human Computer Interaction using Hand Gesture” Engineering in Medicine and Biology Society. EMBS 2008 30th Annual International Conference of the IEEE 2008.
- [3] S. Sadhana Rao, “Sixth Sense Technology”, Proceedings of the IEEE International Conference on Communication and Computational Intelligence – 2010, Kongu Engineering College, Perundurai, Erode, T.N., India.27 – 29 December, 2010.pp.336-339.