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Non-parametric Activity Recognition System in Smart Homes based on Heterogeneous Sensor Data

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ABSTRACT: In now a days we are seeing that the technology gets so advanced, all the things are now going automatic. So, here we are implementing a project which is based on machine learning. Suppose in our home there are many loads such as fans, light, television so, for operating these things we need manual effort again and again. So by the implementing of this project we can solve out these problem. Here we are using microcontroller as a brain of this project. We have use IR sensor for detecting the presence of human which is directly connected to the microcontroller. When a human enters into room and switched ON the three loads one by one manually which is connected by the microcontroller (firstly sw1 then sw2 lastly sw3) so this operation is learned by the microcontroller so, again when the IR will detect i.e. human is detected so this operation will be performed automatically without manual operation

KEYWORDS: Infra Red (IR), Switch(SW)

I. INTRODUCTION

In now a days we are seeing that the technology gets so advanced, all the things are now going automatic. So, here we are implementing a project which is based on machine learning. Suppose in our home there are many loads such as fans, light, television so, for operating these things we need manual effort again and again. So by the implementing of this project we can solve out these problem.

The devices which comprise an AI-powered Home Automation system should be able to provide services both to each other and to the end user – and continuously acquire new data for further learning.

The key part of such solutions constitutes a data analytics module where raw sensor readings are processed and data patterns are identified, so the system knows event A (a home owner unlocks the front door) is usually followed by event B (the heating is turned up).

With those data patterns, a Smart Home system should be able to predict a user's behavior based on historical data and develop the so-called situational awareness – i.e., understand a user's intentions at a given moment and change parameters accordingly.

II. EXISTING CONTROL SCHEME

In old days the technology was not advanced .we has to operate all the home appliances by the help of human effort.

If by mistake when we forget to put off our loads so the electricity consumption was also there.

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Drawbacks

- Human effort was needed for switching operation. They cannot be switched on and off at high speed because they have a slow response and the switch contacts will rapidly wear out due to the sparking.
- Wastage of electricity was more. In case of control wire logic entire physical arrangement should be changed and reconfiguration cost is more.

III. PROPOSED CONTROL SCHEME

In this proposed system we are overcoming the existing system in proposed we are doing automatic switching operation without human effort based on the concept on machine learning. Below Figure shows that Our proposed block layout.

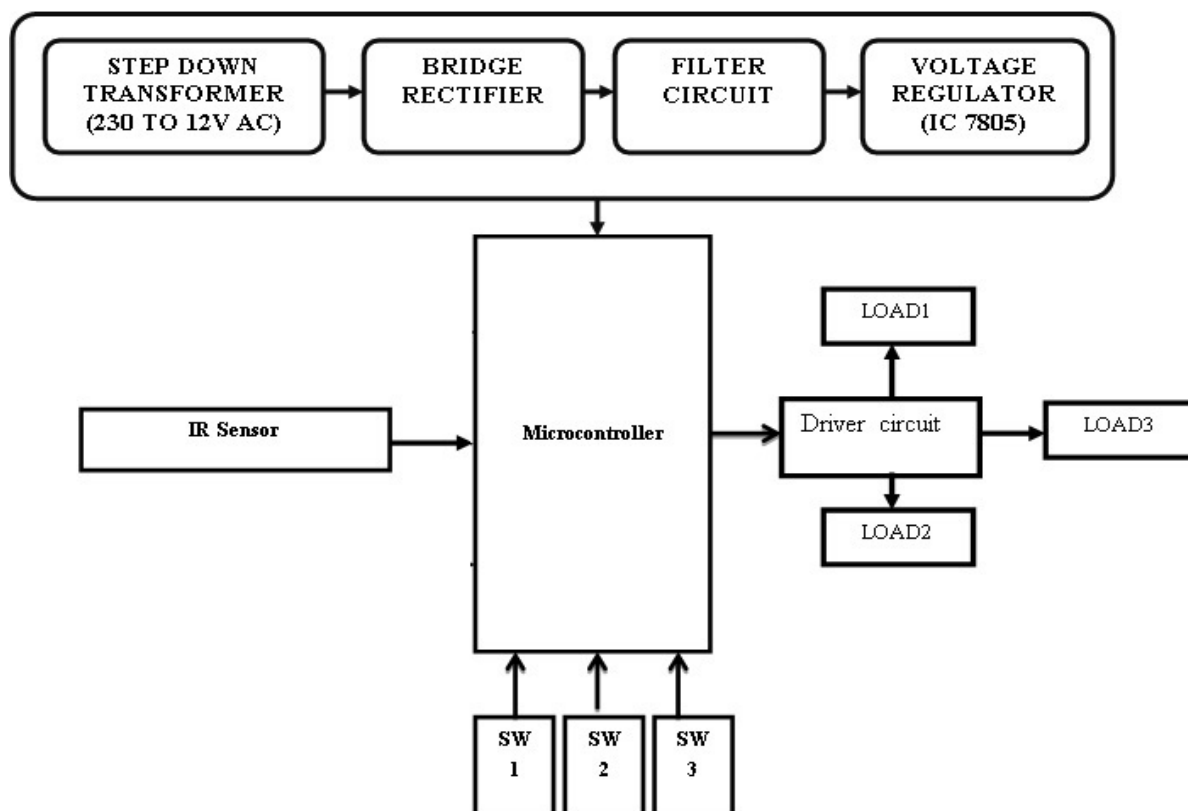


Fig 1. Block diagram

Here we are using microcontroller as a brain of this project. We have use IR sensor for detecting the presence of human which is directly connected to the microcontroller.

Suppose when a human enters into room and switched ON the three loads one by one manually which is connected by the microcontroller (firstly sw1 then sw2 lastly sw3) so this operation is learned by the microcontroller so, again when the IR will detect i.e. human is detected so this operation will be performed automatically without manual operation.

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A microcontroller differs from a microprocessor, which is a general-purpose chip that is used to create a multi- function computer or device and requires multiple chips to handle various tasks. A microcontroller is meant to be more self-contained and independent, and functions as a tiny, dedicated computer.

They are typically designed using CMOS (complementary metal oxide semiconductor) technology, an efficient fabrication technique that uses less power and is more immune to power spikes than other techniques. There are also multiple architectures A microcontroller is an integrated chip that is often part of an embedded system. The microcontroller includes a CPU, RAM, ROM, I/O ports, and timers like a standard computer, but because they are designed to execute only a single specific task to control a single system, they are much smaller and simplified so that they can include used, but the predominant architecture is CISC (Complex Instruction Set Computer), which allows the microcontroller to contain multiple control instructions that can be executed with a single macro instruction.

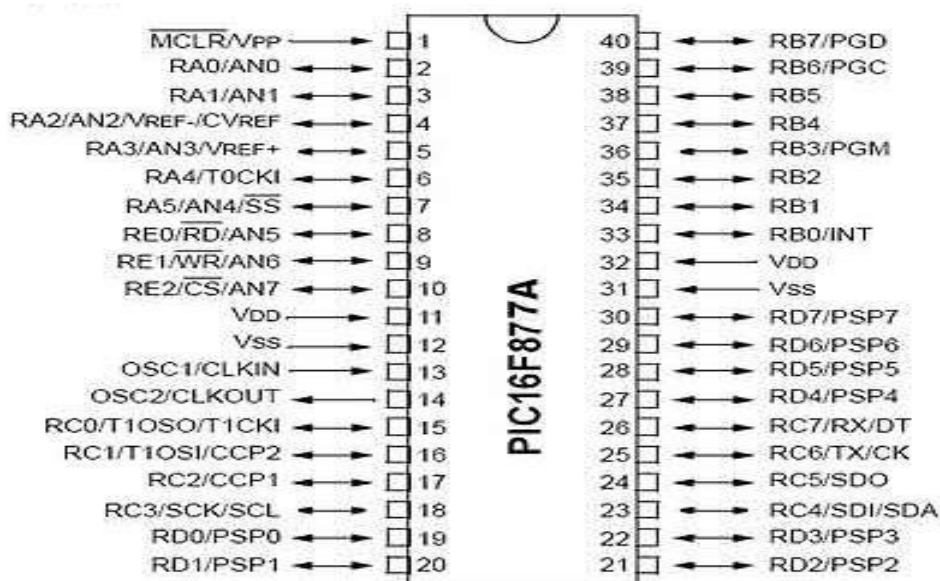


Fig 1.1. Pin Diagram of PIC16F877A

The PIC16F877A CMOS FLASH-based 8-bit microcontroller is upward compatible with the PIC16C5x, PIC12Cxxx and PIC16C7x devices shown in fig 1.1. It features 200 ns instruction execution, 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port. IV.

IV.CONCLUSION

Throughout the course of life, there is time when we live independently in our house without anyone to look after each other. In order to support these people and ensure their safety with limited medical resources and human labours, it is important to constantly monitor one's activity of daily living (ADL). Therefore, we propose an activity recognition (AR) system for people living independently in smart homes to achieve the concept of "aging in place." The AR model adopted by the proposed system is powerful to recognize meaningful ADL by integrating heterogeneous data from both ambient and on-body sensors. Moreover, this proposed system adopts a nonparametric

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approach, which requires much fewer efforts from humans. The average AR precision and recall rates of this proposed system are up to 98.7% and 99.0%, which indicates its feasibility of deployment in a real-life home environment for monitoring users' ADL with promising performance and thus helps realize aging in place.

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