Using Motion Sensor for Auto Controlling Air Conditioner's Temperature

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Abstract— **Article discusses the system of automatic air conditioning temperature setting using human motion detection with PIR sensor. Automatic temperature setting process begins when the absence of humans in a room and the system began to increase the waiting time until the time determined in accordance with the mode selected by the user. Having arrived at the specified time then the system will output a temperature rise of 1-4 ° C. If there is detection of PIR sensors after the system issued an order form of the temperature rise of 1-4 ° C then the system will issue an order decreasing the temperature of 1-4 ° C. The experimental results showed that the system can work well in the area of the room 3x3x3 cubic meter.** *(Abstract)*

Keywords- Controller, AC's temperature, motion sensors, human presence.

I. INTRODUCTION

Along with the advancement of existing technology, humans continue to be given the ease of living. One is the air conditioner or commonly referred to as air conditioner or air conditioning. AC used in the rooms to cool down the temperature so that the room be comfortable, but in most people often do not turn off their air conditioner when the room was abandoned. It certainly is a waste of energy because when the room is empty, no one felt the chill of air conditioning.

Today the continued reduction of fuel energy, and the huge consumption of energy used by air conditioning also energy wastage that occurs as the air-conditioned room that is left without the people in it, it is a waste of energy that should be avoided.

Actually there are already many systems designed to control the temperature control air conditioning and AC activity itself, but most controllers AC mostly serves to turn off or turn on the AC alone, different from the systems, the created system is use to control the temperature of air conditioning. And also most of the existing air-conditioning control system is currently using 1 piece of feedback components only, ie temperature sensors, in contrast to system design are made using 2 pieces of feedback components.

In designing the system being made, focused on a question that is, to whom the air-conditioner use. Of course, air conditioning used to cool the room so that it becomes comfortable for humans. The control system used for the purpose of saving electricity consumption in the use of air conditioning use. While the advantages of the system are made compared to the existing system, is a system that will be made in the form of a control system, then of course there is feedback. In designing the system is 2 pieces of feedback components used, the motion sensor (PIR sensor / Passive Infrared Recever) as well as temperature sensors. And also use akuator mechanical relays that will be connected directly to a remote air conditioning, while the central control system using a microcontroller as a regulator of the data traffic.

II. STRUCTURE OF WRITING

A. Sensor PIR

The sensor works based on infrared business as usual manner. However, unlike the usual infrared sensors, this sensor does not emit anything, it is adapted from the name "Passive", since this tool only respond if the energy from passive infrared beam emitted by all objects are nearby including the human body. This Sensor also is made specially to detect human body.

So initially, when the object (human) is censored then the infrared energy that is contained within the object will be detected by a PIR via the Fresnel Lens. Fresnel Lens is a lens that is used when we enlarged and enlightened an object that wants to be seen. So with a fresnel lens PIR better able to detect the presence of humans nearby.

After that the output of the Fresnel Lens are filtered by the IR filter, IR filter the infrared that has been obtained from the fresnel lens. So that the infrared light that can pass through this filter is from 8 micrometers to 14 micrometers, so that the passive infrared ray which is owned by humans is 9 micrometers to 10 micrometers can be detected by this instrument, also IR filter is useful as for PIR can differentiate the human and other objects nearby. So the PIR sensor will not produce output if the sensor is exposed to hot objects that do not have infrared wavelengths between 8 to 14 micrometers and a stationary object such as a very bright light that can produce heat, the object of a mirror reflection of the object and when the summer heat. The sensor works with a range up to a distance of 5 meters and a detection angle of 60 °.

When finished filtered, then the infrared light that has been filtered is converted into electrical current by the pyroelectric sensor. The workings of the pyroelectric sensor is basically the same as the workings of ordinary solar cell. After that the electric current generated by the pyroelectric sensor will be amplified by an amplifier that already exist

within the PIR sensor. Then after the current has been strengthened so that the flow will be compared before output. Comparator compares the amount of electrical current that existed at the time the object (humans) that move with the amount of electrical current that existed at the time the object (human) was silent.

B. Temperature Sensor

The temperature sensor used is LM35 temperature sensor. LM35 temperature sensor is a chip made of semiconductor materials, acts as a transducer. The output of the transducer in the form of cues / electrical signal is then converted into the form of digits by converting analog signals to digital.

LM35 is a highly accurate temperature sensor is packed in the form of integrated circuit, where the output voltage very linear output corresponding to temperature changes. This sensor has a coefficient of 10 mV / 1 ° C which means that each 1 ° C increase in temperature will increase the voltage by 10 mV.

C. Microcontroller ATMEGA 8535

Microcontroller is an electronic component in which there are processors, memory, and other parts that can be input or output path. Microcontroller is used by objects that are operated automatically. Examples of automotive engine control, remote control, office equipment, toys, and so forth. Because of its small size, the power and the cost of production more efficient with the CPU, memory, and other components separately, in addition, because this excess microcontroller developed to resolve many more processes.

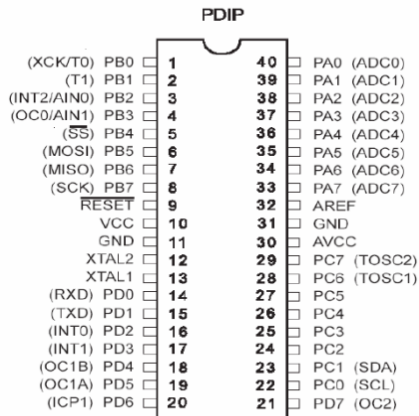Microcontroller Pin Configuration ATMEGA8535

Figure 1: Microcontroller Pin Configuration ATMega8535

D. Module System

The series uses Atmega8535 as a central control processor. The reason is because atmega8535 access each - each port is much simpler, ports in Atmega8535 there are 4 kinds of Port A, Port B, Port C, and Port D. Because Port A can function as analog to digital converter (ADC), the Port A

will be used as input in the form of temperature sensors that are still analog voltage, portC will be used to send data from atmega8535 to 16x2 LCD. ATmega 8535 and also has many Special function registers are useful in designing systems based on block diagrams created above. ATmega 8535 requires the supply of 5V, the voltage supply is taken from the voltage regulation results from the 7805 5V regulator circuit.
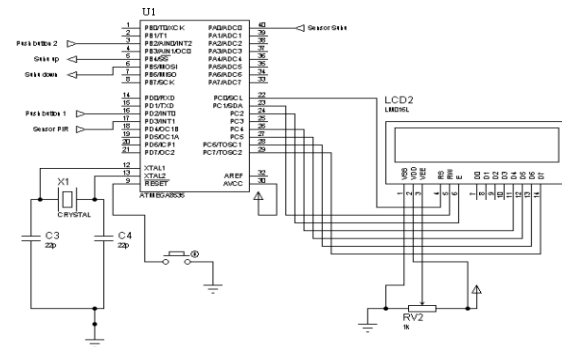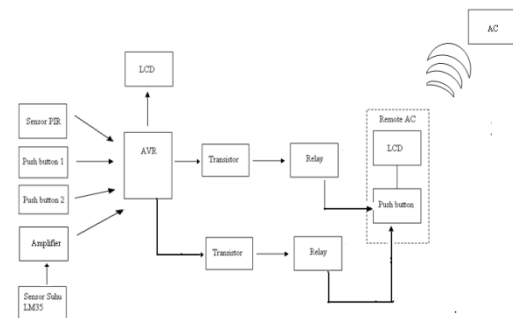

Figure 2: Control Center Circuit

Figure 3: Block Diagram of System

This section will discuss about all the flow charts used in the system, namely the main system flow charts, flow charts interupsi0, interupsi2 flow charts, flow charts feedback, and the latter the initiation of special function registers that are in atmega8535 and used in system design and explanation..

III. SYSTEM DECRIPTION

This section will discuss about how the system works when the system standby for more details here the following flow chart. This flow chart was designed using code vision program normally used to program the microcontroller atmega8535 behavior.

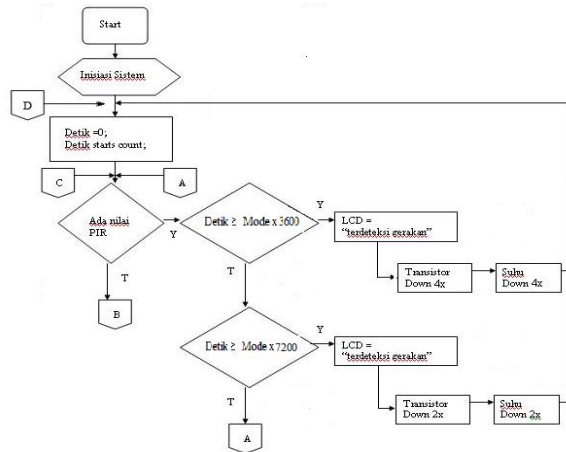30°C because of the limited reach of the remote temperature conditioning is used.

Figure 4: Flowchart Of Main System When Lowering Temperature
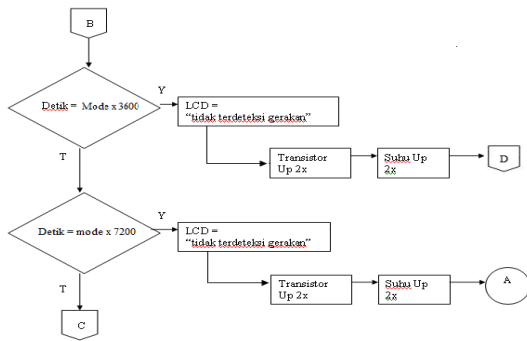
Figure 5: Flowchart Of Main System When Raising Temperature

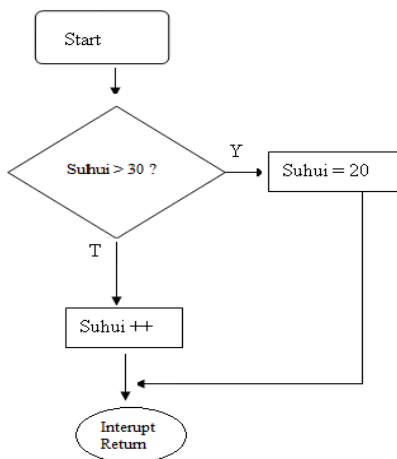FLOWCHART OF INTERUPSI0 SERVICE ROUTINE

Figure 6: Flowchart When Interupsi0 Pressed

Interupsi0 serve as user input, so a user can enter how much the temperature of the room they want by pressing the interupsi0. However, limited temperature ranges from 20°C -

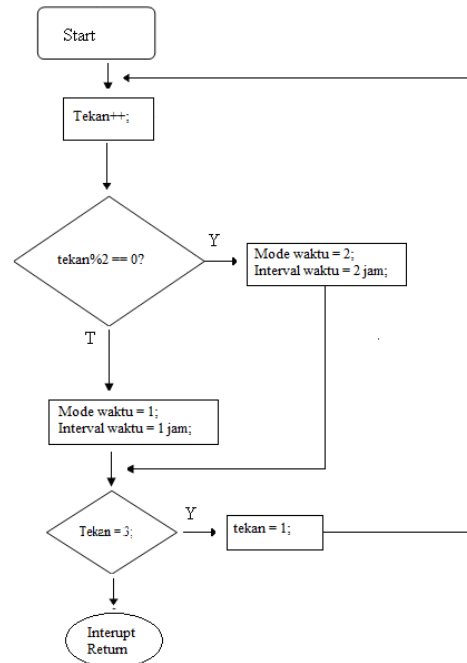FLOWCHART OF INTERUPSI2 SERVICE ROUTINE

Figure 7: Flowchart Of Interupsi2

Interupsi2 will be used as user input. Users can choose how many intervals to set the desired temperature, but here the time interval is limited only 2 modes, that is 1 hour and 2 hours.
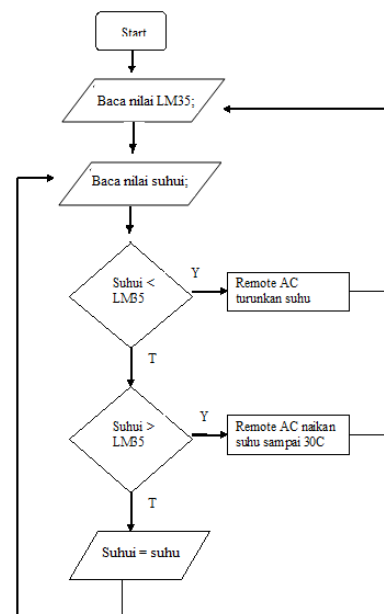
FEEDBACK FLOWCHART

Figure 8: Feedback Flowchart

Because the system created a room temperature control system, then there should be a feedback that is used as a benchmark to control the temperature of the room. This section will discuss about how the feedback system used within the system design.
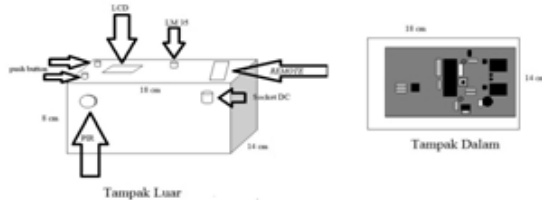
FABRICATION

Figure 10: System Fabrication Outside And Inside Look

Design using cardboard that has been modified by the size of 18x14x8 centimeters. PIR sensor is placed facing into the room and the remote is placed on top of the casing. And temperature sensors are placed on top of the casing so that more able to detect the temperature of the room while the push button which is used as user input is placed on the LCD.

For placement in the room, the device should be placed at the front door and forward-facing air-conditioning for the signals transmitted by the remote can be accepted by the AC properly.
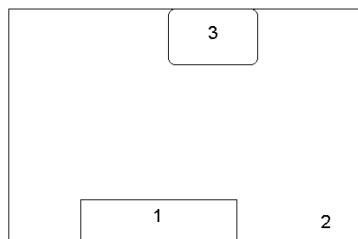

Figure 11: Device Placement Inside The Room

Note:
1. AC's position inside the room
2. Entrance
3. Device

IV. IMPLEMENTATION AND EVALUATION

Operation of the system begins by providing Vcc voltage DC (Direct Current) +5 volts, and entered into the system initiation phase in which all registers within the microcontroller Atmega8535 enabled. After that the system will wait for the PIR sensor is ready after that users will choose the mode that will be used.

When the mode is selected either mode 1 or mode 2 the system would work by raising or lowering the temperature of the AC (Air Conditioner) according to the mode selected and the status of the PIR sensor (Passive Infrared Receiver). When mode 1 is selected when the temperature is raised and

lowered adjusted at the time of the PIR sensor detection and time has been calculated from the beginning between 1 hour and 2 hours, this means if the PIR sensor does not detect any person in a room inside the interval of 1 hour, then the temperature of air conditioning will be increased as much as 1°C and this is done up to 2 hours. While in mode 2 which is calculated from the initial time is 2 hours and 4 hours, this means that if the PIR sensor does not detect the presence of people in a room in the interval of 2 hours, the temperature of air conditioning will be increased as much as 2°C and this is done to 4 hours. While the temperature sensor is used to detect how the temperature inside a room.

The evaluation was done by conducting several types of experiments to determine whether the system works as expected or not. Does the system affected by external factors that caused the system not working properly. After the experiment the system cannot work properly if the PIR sensor is blocked by an object. And temperature sensors are also used to have self-heating of 0.5 C. This is of course affect the precision.

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V. CONCLUSION

From the results of the implementation and evaluation of automatic air-conditioning temperature control system using human motion detection with PIR sensor. Retrieved conclusions as follows. First, the PIR sensor cannot work properly when given the disruption of blocking by object. Second, the PIR sensor does not detect the presence of living beings other than humans and inanimate objects that move. Third, the PIR sensor can detect a human up to a maximum distance of 5 meters. Fourth, the average time required for the active involvement of the PIR sensor is off by 28.4 seconds. Fifth, the temperature sensors recorded a maximum temperature error of 0.5 ° C. Sixth Remote AC can give orders to AC even if given in the form of blocking disruption.

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