Electronic Control Equipment

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Abstract **- The human need for electronic equipment to help their job, it is mean people will spend a lot of time to operate them. The function of switch on and off of electronic tools has been found to control devices that use infrared But the use of infra-red has some weaknesses, that are communication should take place in a straight line and from a very close distance. Design tools of control system such as remote control using wireless based on microcontroller, aim to help all of people to control their electronics equipment and accelerate the work of people to operate electronic equipment in all directions and all distances. This system can be used for people to control of some electronics equipment that are often used of daily life so that the people can't spend their time to operate and can save their energy. The circuit control builder comprising tools: a transmitter, emitters, input, process and output with SDLC (Systems Development Life Cycle) methodology design. Based on the test results show that it has successfully built a system that can control electronic equipment, it is also done remotely using wireless communication. Setting the maximum distance to the room with the hitch is 2 meters, while in open space without barriers it can reach 8 meters without antena.**

Keywords: Remote Control, Wireless, Transmitter, Emitter, Microcontroller.

I. INTRODUCTION

The human need for electronic equipment is so large that people will spend a lot of time to operate one of which is lit and extinguished, or as a function of the switch on and off of electronic tools, the current has been found to control devices that use infrared But the use of infra-red has some weaknesses that communication should take place in a straight line and from a very close distance. This can be overcome by controlling wirelessly without having to press the switch directly, not necessarily a straight line and very close to the equipment to be controlled so that it will bother the operation of electronic equipment can be resolved. For example, to control the lights and TV houses located in the second floor should be done by pressing a button on each switch directly, of course, it will drain a lot of energy and will spend a lot of time, therefore arises the idea of innovation control device electronic equipment use excellence-based wireless microcontroller with a control device such as the remote control that can be used to control multiple electronic devices indirectly.

Control of electronic equipment may indirectly be done by using a wireless network that has the ability to connect the controller with hardware electronic via radio waves to a transmitter radio-frequency (RF) which can operate at a frequency of 27 MHz, and do not use a cable that can ruin the beauty for cable installation slobbery. Therefore we designed a device that can exercise control over the electronic equipment via wireless by using controls such as remote control.

II. BASIC TEORY

Wireless communication is the transmission medium between the data transmission (transmitter) with a data receiver (receiver) without intermediary cables. The data moves from the transmitter (transmitter) to the receiver (receiver) propagates freely in the air. These data are in the form of radio signals with different frequencies. Frequency has an inverse relationship with the wavelength propagating in air. (Malvino, 1995)

Relay is an electronic switch that can open or close a circuit by using control of other electronic circuits, relays can be used for switching or load control. Relay in control applications is often used as a switching input or output on a PLC or microcontroller.

Two divider circuit uses IC DFF (Delay Flip Flop) in the picture above is the core of the series One Switches Two Logic. If the input box to enter a signal with a certain frequency, then the output signal will exit the box with half the frequency of the input signal frequency. So any change in output occurs if the logic input gets a 'clock'. One 'clock' will vary depending on the type of IC DFF used. If the nature of the input CLK is the 'rising edge' (change from logic low to logic high),

then the 'clock' is when the logic input changes from logic low to logic high.

Utilizing these two properties divider, can be made series One Switches Two Logic: add a temporary press the switch at the input as shown below:

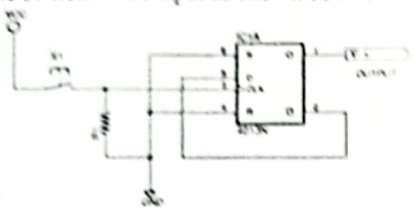

Figure 1. IC DFF (Delay Flip Flop) circuit

The circuit uses IC DFF (Delay Flip Flop) was added as a resistor R1 Resistor Puil Down to prevent state threshold. So if the switch S1 is not pressed, the logic input CLK is logic low. Then, when the switch S1 is pressed, changes the logic from low to high and output logic changes. Once S1 is pressed, the output logic high. S1 is pressed again, the output logic low. If S1 is pressed again, the logic high output back, and so on.

III. METHODOLOGY

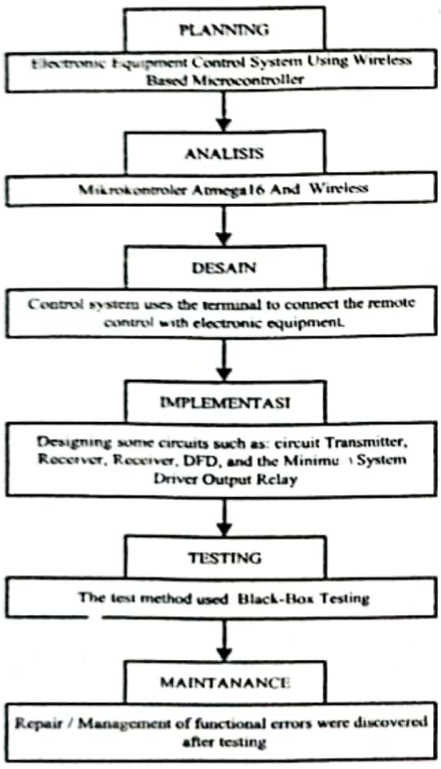

Figure 2. Flowchart

Design methodology used in the design tool control electronic devices using wireless-based microcontroller is a method of SDLC (Systems Development Life Cycle) comprising the steps of: a plan (planning), analysis (analysis), design (design), implementation (implementation), testing (testing) in the form of Black-Box testing, which is a method used to find errors and demonstrating functional when operated applications, whether received correctly input and output has been as expected, and management (maintenance).

IV. RESULT

1. Observation Data

Here's a series of measurement data electronic equipment control devices using wireless-based microcontroller.

1.1 Measurement Results of Transmitter (Tx) and Receiver (Rx) circuit

Tabel 1 The results of the measurement circuit TX and RX

INPUT TX				OUTPUT RX (V)			
S1 (up)	**S2 (down)**	**S3 (Right)**	**S4 (Left)**	**M1**	**M2**	**M3**	**M4**
1	0	0	0	4,8	0	0	0
0	1	0	0	0	4,8	0	0
0	0	1	0	0	0	4,8	0
0	0	0	1	0	0	0	4,8

Description: M1, M2, M3 and M4 = Output Cable Receiver

Measurement range of the transmitter (Tx) and receiver (Rx) held on Monday, February 3, 2015 using analog multimeter. According to the table 11 the results of the measurement circuit TX and RX aware that Input transmitter (S1) corresponds to an output receiver (M1), Input transmitter (S2) corresponds to an output receiver (M2), and Input transmitter (S3) associated with the output of the receiver (M3) and input transmitter (S4) related to the receiver output (M4), at the time of switch 1 (SMA) is pressed, the receiver output (M1) has a voltage of 4.8 V while the other receiver output, namely: M2, M3, and M4 has a voltage of 0 V at the time of switch 2 (below) is pressed, the receiver output (M2) has a voltage of 4.8 V while the other receiver output, namely: M1, M3, and M4 has a voltage of 0V. And when the third switch (right) is pressed, the receiver output (M3) has a voltage of 4.8 V while the other receiver output, namely: M1, M2, and M4 has a voltage of 0 V. And when the switch 4 (left) pressed the receiver output (M4) has a voltage of 4.8 V while the other receiver output, namely: M1, M3, and M2 has a voltage of 0 V.

1.2 Measurement Results of Minimum System Series

Tabel 2 The results of the measurement circuit minimum system

INPUT DFF (V)				OUTPUT SISMIN (V)			
DF F1	DF F2	DF F3	DF F4	M1	M2	M3	M4
Port B.1	Port B.2	Port B.3	Port B.4	Port D.1	Port D.2	Port D.3	Port D.4
4,8	0	0	0	4,8	0	0	0
0	4,8	0	0	0	4,8	0	0
0	0	4,8	0	0	0	4,8	0
0	0	0	4,8	0	0	0	4,8

Information:
DFF1, DFF2, DFF3 and DFF4 = Input Delay Flip-Flop
M1, M2, M3, and M4 = Output of Minimum System

Measurement circuit minimum system held on Monday, February 3, 2015 using analog multimeter. Based on the results of the measurement circuit Table 12 minimum system can be seen that Input Delay Flip-Flop (DFF1) situated on Atmega 16 microcontroller portB.1 obtained from the receiver output M1 which will then be issued on portD.1 ATmega16 microcontroller with a voltage of 4.8 V , input Delay Flip-Flop (DFF2) situated on Atmega 16 microcontroller portB.2 obtained from the receiver output M2 which will then be issued on portD.2 ATmega16 microcontroller with a voltage of 4.8 V, and input Delay Flip-Flop (DFF3) Near the portB.3 microcontroller Atmega 16 M2 acquired from the receiver output will then be issued on portD.3 ATmega16 microcontroller with a voltage of 4.8 V and input Delay Flip-Flop (DFF4) situated on Atmega 16 microcontroller portB.4 obtained from the receiver output M2 which will then be issued on portD.4 ATmega16 microcontroller with a voltage of 4.8 V.

1.3 Measurement Results of Driver Relay circuit

Tabel 3 The Result Measurement of output driver relay

DR	VB (V)	VC (V)	RELAY		LED	
			Aktif	Non aktif	Nyala	Tidak Nyala
DR 1	4,2	4,8	✓	-	✓	-
	0	12	-	✓	-	✓
DR 2	3	4,8	✓	-		-
	0	12	-	✓	-	✓
DR 3	3	4,8	✓	-	✓	-
	0	12	-	✓	-	✓
DR 4	3	4,8	✓	-		-
	0	12	-	✓	-	✓

Description: DR1, DR2, DR3, dan DR4 = *Output Driver Relay*
B = Based voltage
C = Colector Voltage

Measurement circuit relay driver outputs held on Monday, February 3, 2015 using analog multimeter. Based on the results of the measurement table 13 relay driver output circuit is known that when the base (VB) on the relay driver (DR1) voltage gain then the relay will be active, active Relay (DR1) will turn on the LED indicator lights are mounted on the base. A large voltage which is at the base driver relay 1 (DR1) of 4,2V and voltage are in colektor and emitter equally with 4,8V, while when the base voltage (VB) in the driver relay 1 (DR1) did not get a voltage or voltage equal to 0 V, the relay is not active. While the voltage on the relay driver colektor 1 (DR1) of 12 V. Not terhubungnya colector with the emitter causes the relay will not be active. when the base (VB) on the relay driver 2 (DR2) voltage gain then the relay will be active, active Relay 2 (DR2) will turn on the LED indicator lights are mounted on the base. A large voltage which is at the base of relay driver 2 (DR2) of 3 V and the voltage is at colektor and emitter equally with 4.8 V, while when the base voltage (VB) on the relay driver 2 (DR2) did not get a voltage or voltage equal to 0 V, the relay is not active. While the voltage on the relay driver colektor 2 (DR2) of 12 V. Not terhubungnya colector with the emitter causes the relay will not be active. when the base (VB) in the driver relay 3 (DR3) voltage gain then the relay will be active, active Relay 3 (DR3) will turn on the LED indicator lights are mounted on the base. A large voltage which is at the base driver relay 3 (DR3) of 3 V and the voltage is at colektor and emitter equally with 4.8 V, while when the base voltage (VB) in the driver relay 3 (DR3) did not get a voltage or voltage equal to 0 V, the relay is not active. While the voltage on the relay driver colektor 3 (DR3) of 12 V. Not terhubungnya colector with the emitter causes the relay will not be active. Similarly, when the base (VB) in the driver relay 4 (DR4) voltage gain then the relay will be active, active Relay 4 (DR4) will turn on the LED indicator lights are mounted on the base. A large voltage which is at the base of relay driver 4 (DR4) at 3 V and the voltage is at colektor and emitter equally with 4.8 V, while when the base voltage (VB) on the relay driver 4 (DR4) did not get a voltage or voltage equal to 0 V, the relay is not active. While the voltage on the relay driver colektor 4 (DR4) of 12 V. Unconnect the colector with the emitter causes the relay will not be activated.

2. Discussion

The design of the system control device such as a remote control electronic devices without using cables

(using radio frequency (RF: Radio Frequency)) which consists of several series, namely Networks: Transmitter, Receiver, Rectifier, Input DFF, Minimum System, and Driver Output Relay.

Transmitter (transmitter) is used to control electronic devices that can operate at a frequency of 27 MHz. Transmitter types used are Full Function Controller. Full Function Controller is a kind of controller that can control two instructions at once. These types of controllers generally have six control, but our tool takes only four of the six such control are: Up, Down, Left, and Right. Receiver (receiver) is used to receive the signals transmitted by the transmitter. Rectifier (rectifier) used to rectify the AC wave into a wave DC rectifier type used is a full-wave rectifier using two diodes. There is a range of IC Delay Flip-Flop (DFF), which serves to make the output in the second state (High and Low) with one switch. Minimum System Microcontroller and serves as a data processor provided by IC Delay Flip-Flop which will then control the relay driver outputs.

At the moment one switch is pressed, for example, switch 1 (SMA) on the transmitter is pressed, the receiver outputs are connected to the switch 1 (SMA) that M1 has a voltage of 4.8 V while the other receiver output, namely: M2, M3, and M4 teganagn not have a voltage or equal to 0 V, it indicates that the transmitter has sent a signal at a frequency of 27 Mhz and the receiver detects the presence of the signal on the waveform. Signals obtained receiver will be forwarded to the filter to remove wave signals that are beyond 27 Mhz. Then this signal will be input for Delay Flip-Flop IC 4013, IC Delay Flip-Flop receive input signals in the form of input CLK is rising edge (change from logic low to logic high). Based on the results of the measurement circuit Table 11 minimum system is known that the receiver output will be the input for Delay Flip-Flop (DFF1) located at portB.1 Atmega microcontroller 16 which will then be issued in portD.1 microcontroller ATmega16, so the output voltage is at receiver M1 of 4.8 V to be received by the input Delay Flip-Flop (DFF1). DFF1 voltage is at minimum will be processed by the system microcontroller and then will be issued in portD.1. Then the output voltage to the minimum system microcontroller to the base of NPN transistor so that the flow of Colektor will flow to the emitter, so the voltage 12 V will flow in colektor toward the emitter so that the relay is active, (see the picture 18 Driver circuit Output Relay). Based on the results of the measurement table 12 relay driver output circuit is known that when the base (VB) on the relay driver (DR1) voltage gain then the relay will be active, active Relay (DR1) will turn on the LED indicator lights are mounted on the base. A large voltage which is at the base driver relay 1 (DR1) of 4,2V and voltage are in colektor and emitter equally with 4,8V, while when the base voltage (VB) in the driver relay 1 (DR1) did not get a voltage or voltage equal to 0 V, the relay is not active. While the voltage on the relay driver colektor 1 (DR1) of 12 V. Not terhubungnya colector with the emitter causes the relay will not be active.

In the software development life cycle (Systems Development Life Cycle: SDLC) a process that has been done is the testing process (testing) using the Black-Box Testing. Black-Box Testing is a method used to find errors and demonstrating functional when operated applications, whether received correctly input and output has been as expected.

Based on the Black-Box Testing indicates that the data submitted by the transmitter can be received by the receiver, thc input data is processed in the microcontroller through DFF IC to control the relay driver outputs. The controlled output driver relay signaling equipment connected to the relay driver output terminal can be controlled as expected. However, on the theory malvino, 1995 which categorizes 3-30 Mhz frequency is High Frequency (HF), which has a wavelength of 10-100 m. Been anticipated so that the controller can control electronic equipment at a distance of 10-100 m. However, after the construction of the electronic equipment control system that operates at a frequency of 27 MHz, the maximum distance control with a hitch just 2 meters, while for open space without barriers is only 8 meters. This control is done without the use of an antenna on the receiver, it is assumed that the cause of not achieving a distance of uncontrolled electronic equipment at wavelengths consistent with the theory that there has been due to the absence of antenna to amplify the receiver to receive the signal transmitted by the transmitter, otherwise it causes the other is the power supply to the transmitter inadequate thus affecting the working system transmitter as a transmitter.

V. CONCLUSIONS

Some things that can be inferred from observations at the beginning of this project are as follows:

1. By design some circuits, such as circuit: Transmitter (sender), Receiver (receiver), Rectifier, Input DFF (Delay Flip-Flop), Microcontroller ATMEGA16 Minimum System, and Output Driver Relay can be used as a switching system for controlling on / off electronic equipment;
2. Microcontroller ATmega16 serves as a data processor which will then be sent to the relay driver outputs. At the time of the relay driver outputs obtained data from the microcontroller then the relay will be active;
3. With the remote control device in the form of electronic equipment using wireless microcontroller based control electronic

equipment can cope easily without constraints of distance and save energy.

4. System Design tools such as remote control of electronic devices using wireless microcontroller based control equipment can be developed in more than 10 electrical appliances with a means of control with the help of microcontroller.
5. The system can be used in electronic equipment that works at a voltage of 220V so it would cause humans to control or operate the electronic equipment household

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