Cell phone based Home Appliance Control system

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Cell Phone Based Home Appliance Control System

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Abstract*— It often happens that we forget to switch off some electric devices while leaving home for a journey. This will result in wastage of energy and even the device may get damaged due to overheating. Even if we remember that we have not switched off some devices, it may be difficult for us to come back and switch them off. Also, if we are away from home we may have to turn on the lights at night. These are normally not possible in present condition. This paper offers a solution for this problem by using a mobile phone, a common electronic device like AC, tube light, fan, water pump etc. can be controlled by using this circuit.

***Index Terms*— Home Appliances; RF communication; Mobile communication; Johnson counter; CD4017.**

I. INTRODUCTION

A home appliance control system (HACS) is a system which provides various services to remotely operate on home appliances, such as microwave oven, TV, and garage door etc. through remote devices such as mobile phone, desktop and palm-top. This document furnishes the controls of the ON/OFF action of almost any home appliance. The mobile phone is been used in this regard. We can control device switching from almost any corner of the world without any call charges.

Earlier efforts include the work of A. Mahmood, who discuss different options of hardware technique [1] for power controlling and monitoring architecture. For Monitoring, hardware is based on current or voltage measuring circuits, Micro Controller Unit (MCU) relay and Zigbee Reduce Function Device (RFD). Chia-Hung Lien, who worked on the Power Monitoring [3] and Control for Electric Home Appliances Based on Power Line Communication. Soyoung Hwang, who worked on developing a Remote Monitoring and [4] Controlling System Based on ZigBee Networks. V. Sathya Narayanan developed Design of Wireless Home automation [2] and security system using PIC Microcontroller. G. Raghavendran developed SMS based [5] wireless home appliance system.

Our work provides the advantages of appliance control by a cell phone, through this we can control the devices from any part of the world provided there must be network connection in cell phone. This system has wider range as large as the coverage area of the service provider and also no interference with other controllers and up to ten controls. So this system will be a simple, powerful and flexible tool that will offer this service at any time, and from anywhere with the constraints of the technologies being applied. Possible target appliances include (but are not limited to) microwave oven, Room lights and fans, TV, and garage door etc. Conventionally, others use RF circuits, which have the drawbacks of limited working range, limited frequency range and limited control. Use of a mobile phone for devices control can overcome these limitations.

II. OVERVIEW OF THE TECHNOLOGY USED

A. CD4017 Working

IC 4017 is basically known as the **5 stage Walking ring counter** IC widely used in chaser lighting circuits. It takes the clock pulses from the **Clock input** and makes one of the ten outputs ON in sequence each time a Clock pulse arrives. It is a **Decade counter** since the counting is in **Decimal digits** and not in **Binary**.

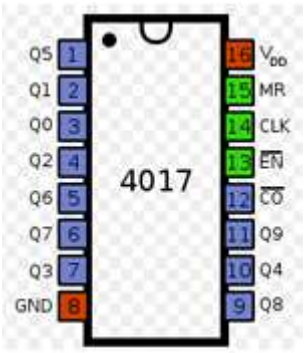

Fig. 1 IC CD4017

CD4017 works off **5-15 volts** while **HEF 4017** operates from **3 volts**. It has 10 outputs and each output can sink **10 mA** current. The IC, take clock pulse from an **external oscillator** and steps the outputs from negative to positive in a series of 10 steps. *Only one output will be high at a time.* The IC can be exploited in different ways. It can be used to count up to a certain number and repeating the sequence or halting the count after a particular count or it can be cascaded to another 4017 IC to get higher numbers. It can be also used as a Bi-stable latch in the toggle mode. Its work is based on the **Johnson counter method** in which the *last stage in inverted and fed to the first stage as input.* The **Register** of the IC cycles through a sequence of **Bit patterns**.

$$L_b = 2 * L_s$$

Where, L_b is the length of the bit pattern.

L_s is the length of the Shift Register.

The IC has 10 Spike free Decoded outputs Q0 to Q9, an Active low Carry out pin and Active high and Active

low inputs namely CP0 and CP1.Its Reset pin is an Overriding Asynchronous Master Reset(MR). The counter advances by either a Low – to – High transition pulse at Active high input CP0 while CP1 is low or a High – to – Low transition at Active low input CP1 when CP0 is high. A High pulse at the Master Reset pin will resets the counter to 0 independent of the clock pulses at CP0 or CP1. The IC also has an Automatic counter code correction mechanism. If there is an illegal code, the counter will returns to the normal counting mode with n 11 clock pulses. The Clock inputs are highly sensitive (Even the e.m.f around the live wire can clock the inputs) and tolerant to slower rise and fall times. The counting action of the 4017 can be understood from the graph below:

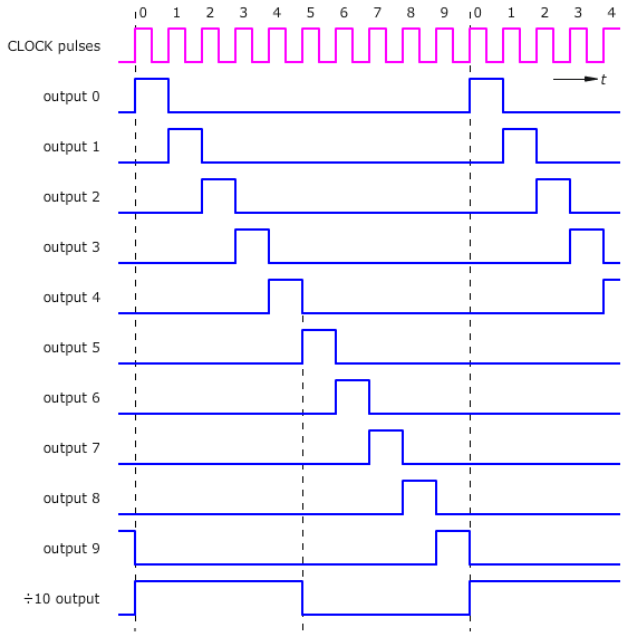

Fig. 2 Clock Pulse response

B. *CD4017 Pin Diagram and Description*

The following Table 1 shows the Pin Description of the IC CD4017.

PIN	DESCRIPTION
1	6th sequential output
2	2nd sequential output
3	1st sequential output
4	3rd sequential output
5	7th sequential output
6	8th sequential output
7	4th sequential output
8	Ground
9	9th sequential output
10	5th sequential output
11	10th sequential output
12	CO – Carry Out – Outputs high on counts 0 to 4. Outputs low on counts 5 to 9 .Thus a transition from low to high occurs when counting from 9 back to 0)
13	LE – Latch Enable – latches on the current output when high (i.e. the chip counts when LE is low)
14	CLK – Clock In
15	RST – Reset – Sets output 1 high and outputs 2 through 10 low, when taken high
16	Vcc – + 3 to +15 Volts DC.

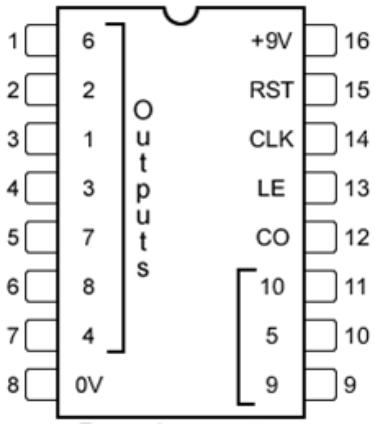

Fig. 3 CD4017 Pin Diagram

III. PROPOSED ARCHITECTURE

A. *Circuit Diagram and Description*

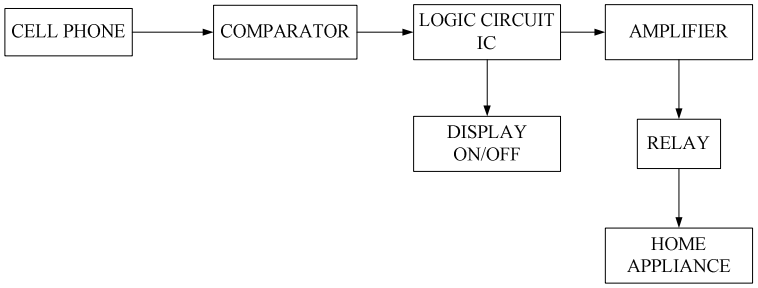

Fig. 4 Block Diagram

Fig. 4 shows the Block Diagram of the proposed System. Microsoft Visio software is used to design the above Block Diagram. IC CD4017 is the heart of the system. The cell phone is connected to the system. When we make a call from mobile phone to the cell phone connected to the system then a pulse is generated in speaker, we use this pulses in this circuit for controlling the devices we use beep ringtone which is already given in all mobile or use a 1 second constant ringtone only one time in a complete one call. As the pulse is generated, The MOSFET IRF530 is triggered and it becomes short so the voltage at that point will become zero. Then there is a comparator which will compare the voltages and responds to the corresponding output which in turn will be the clock pulse for IC CD4017. The main concept of this IC is that when the first positive pulse is applied to the clock signal, the pulse remain same in the output but when another positive pulse is applied it reverses the input as it generates a negative pulse. Then again positive output and negative pulse and so on. This will help this system to control the home appliances. For example let us suppose we have connected room light with this system, as the system will turn ON, the user will give a miss call to the cell phone connected to this system and the pulse will generate and the light will turn ON as well as there are three 7-segment displays which will display the "ON" or "OFF" situations of the appliance. And with the

help of the formula shown below the time period for which the output stay in the high position can be calculated -

$$T = 1.1*R5*C4$$

The following fig. 5, shows the Circuit Diagram of the system proposed:

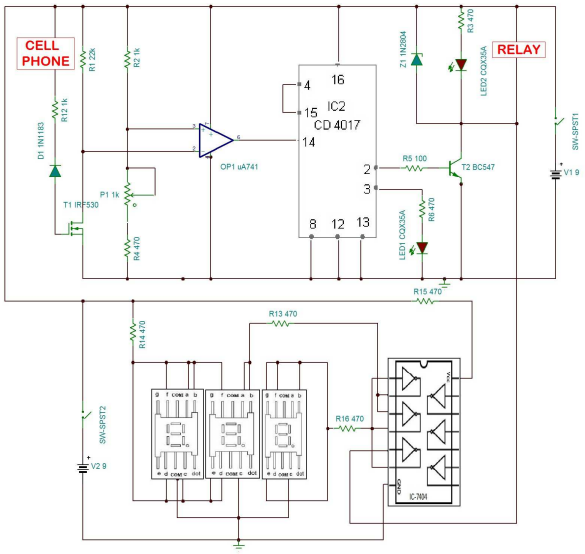

Fig. 5 Circuit Diagram

B. PCB Layout

Following Fig. 6 is the PCB layout of the above circuit Diagram. The software used to design the below PCB is Express PCB.

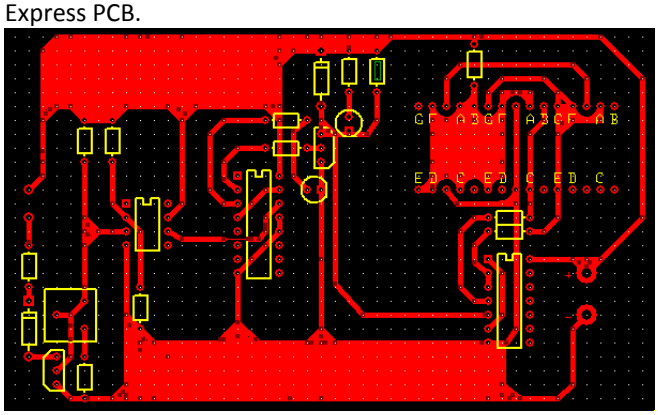

Fig. 6 PCB Layout

IV. APPLICATIONS AND FUTURE SCOPE

A. Traffic Light Control

This circuit can also be simulated as the Traffic Lights controller. The Red, Yellow and Green LEDs lights one by one for a period of 1 minute and the cycle repeats just like the Traffic lights. IC1 (NE555) is the popular timer IC wired in the Astable Multi-vibrator mode. These pulses are given to the input pin 14 of the Johnson decade counter IC CD4017. With the value of C1, each LED remains on for 1 minute. When one LED turns off, the second one turns on. This cycle repeats giving the Traffic light appearance.

B. Touch Based ON/OFF control

The devices can be controlled by just a simple touch. As already explained above, due to touch, a pulse will generate which will turn ON the device and again touching the touch sensor plate, it will turn OFF the device.

V. CONCLUSION

By developing this Home appliance control system with its multi control feature which we are controlling with a cell phone by just a missed call, We have overcome the drawbacks of RF communication which have a limited range as this system can control the home appliances from anywhere in the world. The main advantage of this system is that it is a simplest system with less complexity. A miss call will turn ON the device and again a miss call will also be used to turn OFF the device. Considering all the situations, this system is integrated for less energy consumption and security purpose.

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