

## Rationalization of Electricity and Water Consumption Based embedded system

Amer Sharafeldeen alshafea<sup>1</sup>, Eltahir Mohamed Hussein<sup>2</sup>

Control Engineering Department, El-Neelain University, Khartoum, Sudan

Corresponding author E-mail: [amir842@gmail.com](mailto:amir842@gmail.com)

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### ABSTRACT

The most significant problem that faces the electricity nowadays is the misuse and the wastage of power. Usually the carelessness of the responsible person and the operators, lights had been left on, which appears as misuse of electricity. While the water wastage is another problem, that needs to be dealt with. The project is considered as the main factor to overcome some of these problems by taking automation as a real application. The project aims to control the flow of water, and electrical machines in a simple facility based on an embedded system, which is a small prototype that can be applied in all factories and plans to save the lost resources. Now, from the hardware side, this project consists of the microcontroller (PIC 16F877A) which represents the brain of this system, the other components are, LEDs, two DC motors, two relays, DS1307 which is a real time clock used for adjusting the date and the time in addition to the buzzer. Finally, for programming and designing the circuit, the software packages MikroC compiler and Proteus 8 professional had been used. The paper is working properly, by this method Waste of water and electricity has disappeared, so saving water, and electricity has become a reality.

**Keywords—** Automation; Embedded System; Real Time Clock; Power Consumption; Microcontroller.

### I. INTRODUCTION

Automation machine is used to achieve the human demand, which is a high quality and a greater efficiency. So that the automated machines had increased in our life. The industrial sector requires continuous monitoring and inspection at frequent intervals [1]. There are possibilities of errors at measuring and in various stages involved with human workers [2]. Thus, this project takes a sincere attempt to explain the advantages that the companies will face by implementing automation into them [3]. The human error affects in human life negatively, as we know the water represents the origin of life. Therefore, saving the water is the most necessary thing in the world, and as well the electricity it is a

meaningful part of our life. The industrial field is the most important part in consuming both the water and the electricity [4].

The automation is the precise effort of this paper. In order to automate and minimize human intervention, there is a need to develop a fully-automated machine to reduce the errors caused by humans. The project aims to control the flow of water, and electrical machine in a simple plan, which is a small prototype and can be applied in all factories and plans to save the lost resources [5].

This project is based on the embedded system, where the microcontroller is used for the internal storage of instruction for the implementing function such as logic, sequencing, timing, counting and arithmetic to control through digital or analogue input/ output modules [6]. The other components are, LEDs as indicators, two DC motors are used one as a pump, and the other is as a gate for the plan. Two relays, DS1307 that is a real-time clock, used for adjusting the date and the time, which communicates with microcontroller by the synchronous communication protocol, two wires protocol (I2C), in addition to the buzzer as an indicator [7].

### II. METHODOLOGY:

To explain and brief more about the method, which is used to rationalize electricity and water consumption, which is the purpose of the project by control of gate, light and pump in an industrial prototype. Firstly, by assuming the system works by this way, around 3.00 postmeridian the water pump was turned on once to supply the plan for few hours to irrigation process automatically, depending on time. After that, the main gate is opened by turning on the motor automatically (DC Motor), which is driven by the driver (ULN2003), which is controlled by the microcontroller (PIC16f877A).

Approximately 5.00 pm, the lights are switched on, when the output of the LDR (Light Detector Resistor) the sensor is greater than 0.7 volt, in which the output of this sensor increases and decreases according to the strength of the light around it. The lights are still on as far as the gate remains open.

The plan remains open for five hours and so at 9.50 pm, an alarm sounds to indicate the closure time. The main door is then closed at 10.00 pm and one of the two lamps will switch off. The other lamp is kept on throughout the night. In the next day, the remaining lamp is switched off depending on the signal sent by the LDR to the microcontroller. These are the steps involved in the operation of the circuit.

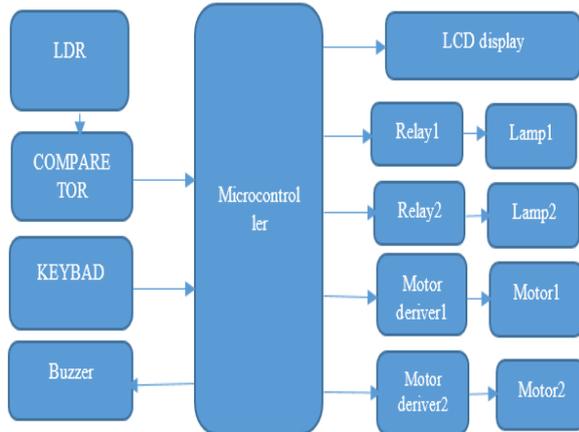


Figure (1). Hardware components

III. SIMULATION RESULTS:

The system is programmed using the embedded C language through MikroC compiler, and the circuit is designed using simulation program proteus8 professional. The figure below shows the simulation result for the whole system after the developed program code was loaded into the PIC.

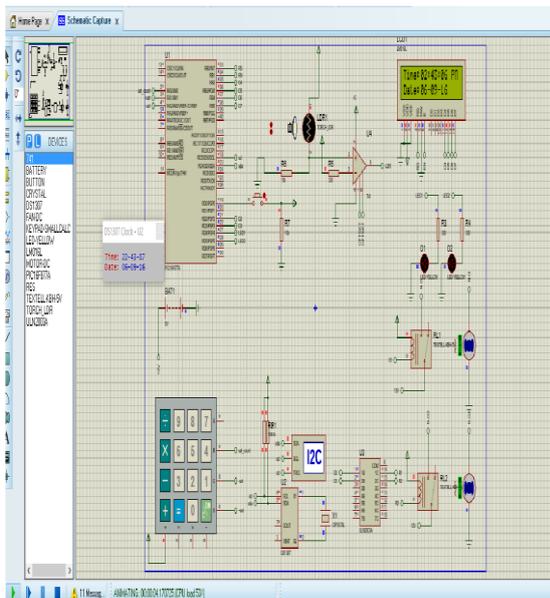


Figure (2): Simulation result PCB Development Using Protous8 Professional

This part explains the process that had been used in order to develop a Printed Circuit Board (PCB) for the project. There were several steps involved in this process like capture circuit-using software, develop physical layout, etching, drilling, inserting components and circuit test.

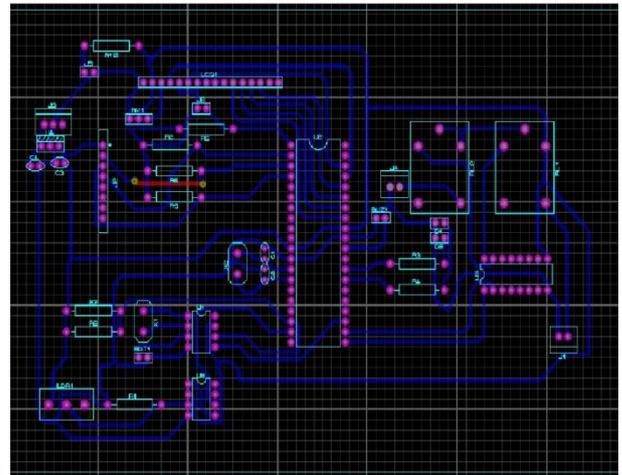


Figure (3): PCB layout

PCB fabrication: The first step of assembling is to produce a printed circuit board. The fabrication of the program counter plays a crucial role in the electronic field. The success of the circuit is also dependent on the PCB, the board is designed using a personal computer, and the layout had drawn using the software proteus8

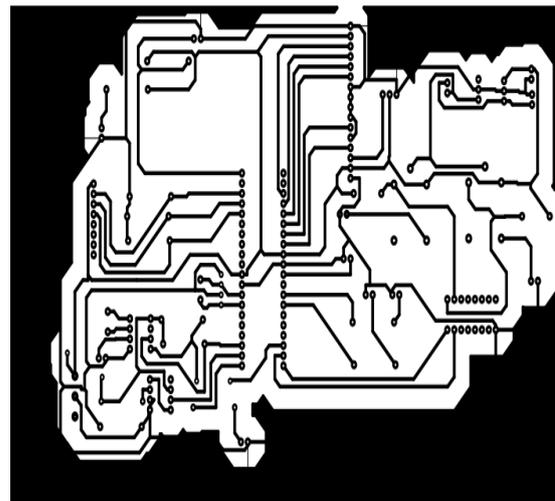


Figure (4): PCB fabrication Components

Hardware Result: Data acquisition system had successfully been implemented and tested, and the circuit had operated regularly.



Figure (5): Hardware Result Modules

#### IV. Results and Discussion

The project decreases power consumption because the lights are being opened only when there is not enough light in the environment, also the electrical machines are running at required time. Thus, it averts wastage of electrical consumption. In addition to water saves, because the water pump is operated only for a specific time. As the same method can be applied, any scenario depends on the application of control in any device.

#### V. CONCLUSION

An approach to control the electricity and water consumption has been delivered in this paper. The system composed of Real Time Clock (RTC) that provide an obvious way to control the pumps and motors. All operations in plan like gate opening, water pumping, and light controlling are automatically full operated, depending on time and specific sensor. Thus, it does not require any human intervention. Therefore, it is guaranteed that the water and electricity will work properly. Finally, the overall design of the system has been tested and operated with high performance. The performance in this paper consists in power consumption; it's low and can be disposed of using rechargeable batteries.

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