International Journal of Latest Research in Engineering and Management" (IJLREM)
ISSN: 2456-0766
www.ijlrem.org Volume 3 Issue 12‖December 2019 ‖ PP 01-05

On a Mega 2560 Application in the Development of a Smart Module Used for Sanitary Ware

Nguyen Tai Tuyen[1], Nguyen Ba Hieu[1]
[1](*Posts and Telecommunications Institute of Technology, Hanoi, Vietnam)*

Abstract: The article presents a Mega 2560 application in developing smart modules for smart sanitary ware. The paper also presents the principle circuit, printed circuit and actual assembly circuit using Atmega 2560paired[6, 7] with distance sensor module, temperature sensor, etc. along with the implementation steps of the algorithm and test model with full functions for smart toilet.
Keywords: Smart Module, smart toilet, smart sink, bathroom.

1. INTRODUCTION

Nowadays, the application of smart devices in homes, offices and hotels has been paying attention to development and application. The bathroom today is not only a place to serve the needs of people, but it also contributes to complete and enhance the overall beauty, contributing to the modernity and comfort for the houses, offices and hotels. It is these that have created the idea of a device that brings many amenities to the house in general and toilets in particular. Therefore, the authors have implemented "Design a Smart Module using Mega 2560 for smart sanitary ware" to be able to apply in practice.

A. Current situation of smart devices in toilets today

1. Smart sanitary ware

Smart sanitary ware is used to refer to the equipment used in bathrooms, toilets with the automation function of cleaning procedures to bring convenience and comfort to a modern, quality life, quality and complete facilities for users. To get the automation function, these sanitary ware must often be equipped with ancillary equipment.

2. Basic types of smart sanitary ware

- The basic sanitary ware often has: washbasins, urinals, showers, baths and toilets.
- Smart lavatory faucet.
- Smart male urinal.
- Smart showers.
- Smart baths.
- Smart toilet.

B. Common mechanism of operation, principles of equipment

- Working according to the principle of touch
- Being pre-programmed for users to choose the mode
- Programming according to user routines

C. Limitations of some of today's sanitary ware

Smart sanitary ware that operate on the principle of induction have some limitations:

- In case the sensor is too sensitive, just glide your hand over the device, water has automatically flowed out to waste water
- In case of sensor noise, with a certain distance allowed, the device still does not automatically discharge water.

II. THE IDEA OF DEVELOPING A SMART MODULE FOR SMART SANITARY WARE

The Smart sanitary ware, especially smart toilets, not only bring convenience and convenience to use, but also bring many other benefits [1, 2, 3, 4, 5].

Specifically:

- Protect sensitive part: real toilet paper is not clean, using hygienic taps will be safer and cleaner
- Cost savings
- Good for children and the elderly: With this product, you will not need to clean childrenafter using the toilet. Just guide your child to the correct position and press the button. This is a very easy way to educate children and help them to be independent in their daily activities. For the elderly, weak, the automation for sanitation is very convenient.
- Do not block toilet: with the use of washing water instead of paper, it will limit the toilet.

III. THEORETICAL BASIS

A.Microcontroller Mega 2560

Mega 2560 supports the microcontroller. Arduino Mega 2560 [6, 7] is different from previous processors because it does not use FTDI controller chip to transfer signals from USB to process. Instead, it uses ATmega16U2 programming as a signal converter from USB. In addition, the basic Arduino Mega2560 is still the same as the Arduino Uno R3, except for the number of pins and more powerful features, so it can be programmed for this microcontroller by the programming program for Arduino Uno R3.

B.The test module

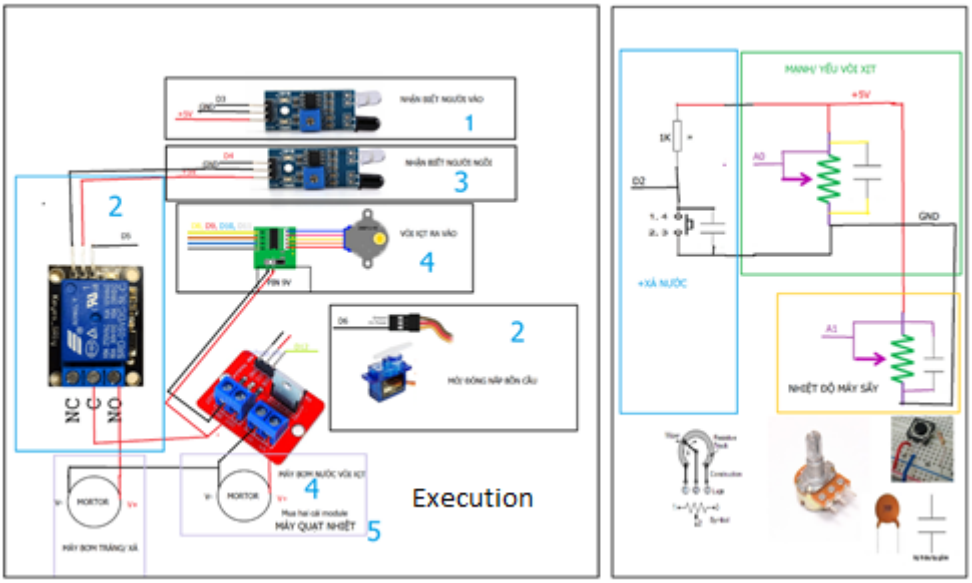

Fig 1. Execution Module

C. Sensors used

1. Distance sensor

The HC-SR04 distance sensor is a sensor used to determine distances in a small range by ultrasound broadcasting. Sensor with high accuracy and high stability during use, and easy to connect to the MCU (Arduino, DSP, AVR, PIC, ARM ...)

2. DC motor control circuit

L298 DC motor control circuit is capable of controlling 2 DC motors, the circuit must be integrated with protection diode and 7805 power IC to supply 5VDC to other modules.

- L298 DC motor control circuit is easy to use, low cost, easy to install.
- Technical data:
  + Main IC: L298 - Dual Full Bridge Driver
  + Input voltage: 5 ~ 30VDC
  + Maximum power: 25W per bridge (capacity = current x voltage so the higher the voltage, the smaller the current, the fixed power 25W)
  + The maximum current for each H-bridge is: 2A
  + Logic voltage level: Low -0.3V ~ 1.5V, High: 2.3V ~ Vss

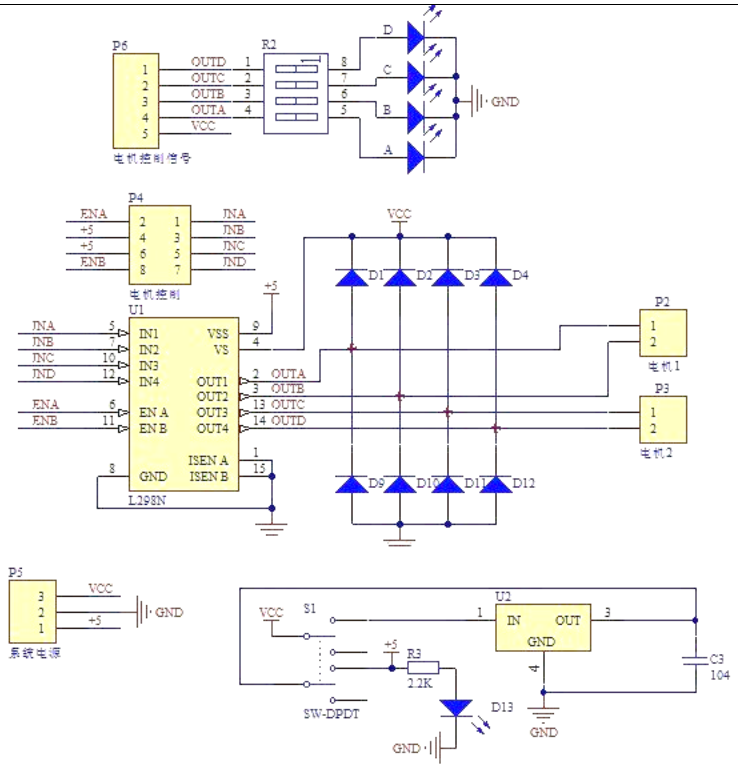

Fig 2. L298 Circuit Principle Diagram

IV. DESIGN OF A SMART MODULE

A. The principle diagram of the smart module

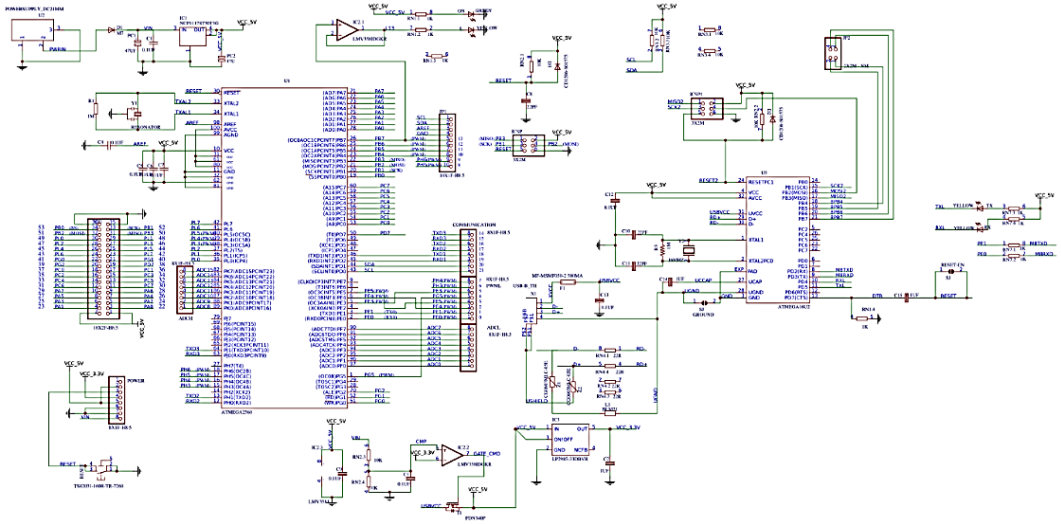

Fig 3. Diagram of the smart module

B. Product design

From the theoretical bases presented above, the authors will apply to the design of smart modules including the following:

- Printed circuit design on Altium software

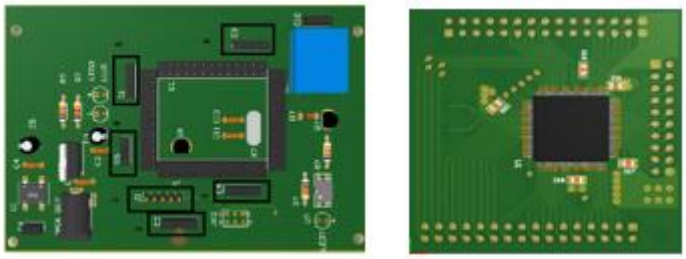

Fig 4. Printed circuit of Smart Module

- Assembling components.

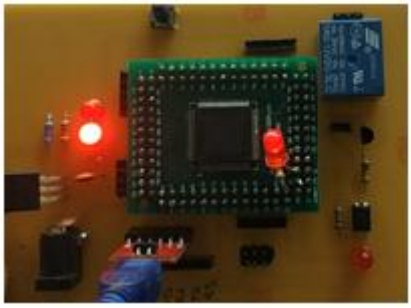

Fig 5. Assembling components of Smart Module

C. The implementation steps of the algorithm

- Step 1: Get started
- Step 2: The sensor recognizes people who enter
  Can stand with male> 60cm (distance sensing ultrasonic sensor), or sit with female sitting <10 cm (distance sensing ultrasonic sensor)
- Step 3: Before use
  + Step 3.1: Rinse the water before using the toilet.
  + Step 3.2: Open the toilet lid.
- Step 4: Define the format to use services for men and women:
  If: 10 cm <(Male) <60 cm (go to the toilet slightly).
  Go to the toilet slightly Female (<10 cm) (Will use the spray function) go to step 4.
  Heavy toilet (both men and women) <10 cm, go to step 4.
- Step 5: Determine the ambient temperature to turn on the heating mode.
  Use heating wire in the form of a thermocouple furnace (the heating thread is put into a jealous tube and attached to the bottom of the toilet)
  If the temperature sensor is <25 degrees, then automatically turn on the heating system, if> 30 degrees then turn off the heating system.
- Step 6: Both Steps 3 and 4 will let the system work properly, allowing the nozzle to go out to be cleaned through the push of a button. (Exit and entry) at will.
- Step 7: Adjust the water system for a mild rinse with a rheostat.
- Step 8: Activate the drying mode
- Step 9: Determine the distance
- If large> 10 cm Step 5 and Step 6 do not work
- Distance> 60 cm, the system activates the Capping mode,
- Step 10: Activate Rinse clean mode.
- Step 11: Return to step 2

D. Experiment

The authors conducted experiments with simulation models, resulting in safer sensor distance, stable operation with temperatures less than 70 degrees and high humidity resistance due to the design of being isolate from surroundings.

V. CONCLUSION

The authors have studied the application of Mega 2560 system in designing smart modules for sanitary ware using Altium electronics to design circuits and Arduino IDE tools for development. Experimental results show that the circuit is stable and suitable for practical applications.

REFERENCES

[1] Fiona Zakariaa, Josip Ćurkob, Ahmed Muratbegovicc, Hector A. Garciaa, *Evaluation of a smart toilet in an emergency camp*, International Journal of Disaster Risk Reduction 27 (2018) 512-523.

[2] Mithya V, Divya Prabha.N, Sisma Samlein S, Madhumitha M, *Smart Toilets using Turbidity Sensor* , International Journal of Innovative Technology and Exploring Engineering , Volume-8 Issue-5S March, 2019.

[3] Mrs.K.Elavarasi, Mrs.V.Suganthi, Mrs.J.Jayachitra, *developing smart toilets using iot*, International Journal of Pure and Applied Mathematics , Volume 119 No. 14 2018, 611-618

[4] Vani K.S, Shrinidhi P.C, *Automatic Tap Control System in the Smart Home using Android and Arduino*, International Journal of Computer Applications (0975 – 8887) Volume 127 – No.8, October 2015.

[5] Dharmesh katariya, pratik parik, akshay pincha, gauri lodha, anita borse, *smart toilet* , International Journal of Electrical, Electronics and Data Communication, ISSN(p): 2320-2084, ISSN(e): 2321-2950 Volume-6, Issue-5, May-2018.

[6] Muthuvignesh, Karthick, Nallakaruppan, Jagadeshkumar, Sathishkumar, *Temperature Control of Steam Using Microcontroller Arduino MEGA 2560*, International Journal of Innovative Research in Science, Engineering and Technology, Vol. 6, Issue 3, March 2017.

[7] Stanislav Kovar, Václav Mach, Jan Valouch and Milan Adámek, *Electromagnetic Compatibility of Arduino Development Platform in Near and Far-Field*, International Journal of Applied Engineering Research ISSN 0973-4562 Volume 12, Number 15 (2017) pp. 5047-5052