AUTOMATIC WATER DISPENSER

Why automatic water dispenser?

About 71% of earth is covered with water, but sadly only 2.5% of it is drinking water. With rise in population, pollution and climate change, it is expected that by as soon as 2025 we will experience perennial water shortages.It might not appear big at the first time, but if your tap dripped a drop of water once every second it would take only about five hours for you to waste one gallon of water, that is enough water for an average human to survive for two days. So what can be done to stop this? As always the answer, for this, lies with improvement in technology. If we replace all the manual taps with a smart one that opens and closes on its own automatically not only we can save water but also have a healthier lifestyle since we don't have to operate the tap with our dirty hands.Here comes the role of automatic water dispenser which can automatically give you water when a glass is placed near it.

Materials Required:

1) Arduino uno(any version)
2) HCSRO4-Ultrasonic Sensor
3) IRF540 MOSFET
4) 1k and10k Resistor
5) Breadboard
6) Connecting wires
7) 3-6V Pump
8) Battery(7-12v)

Working Concept:

The Concept behind the Automatic Water Dispenser is very simple. We will use a HCSR04 Ultrasonic Sensor to check if any object such that the glass is placed before the dispenser. A Pump will be used to control the flow of water.So we will write an Arduino program which always checks if any object is placed near the tap, if yes then the pump will be turned on and wait till the object is removed, once the object is removed the pump will turn off automatically thus closing the supply of water.

Circuit Diagram:
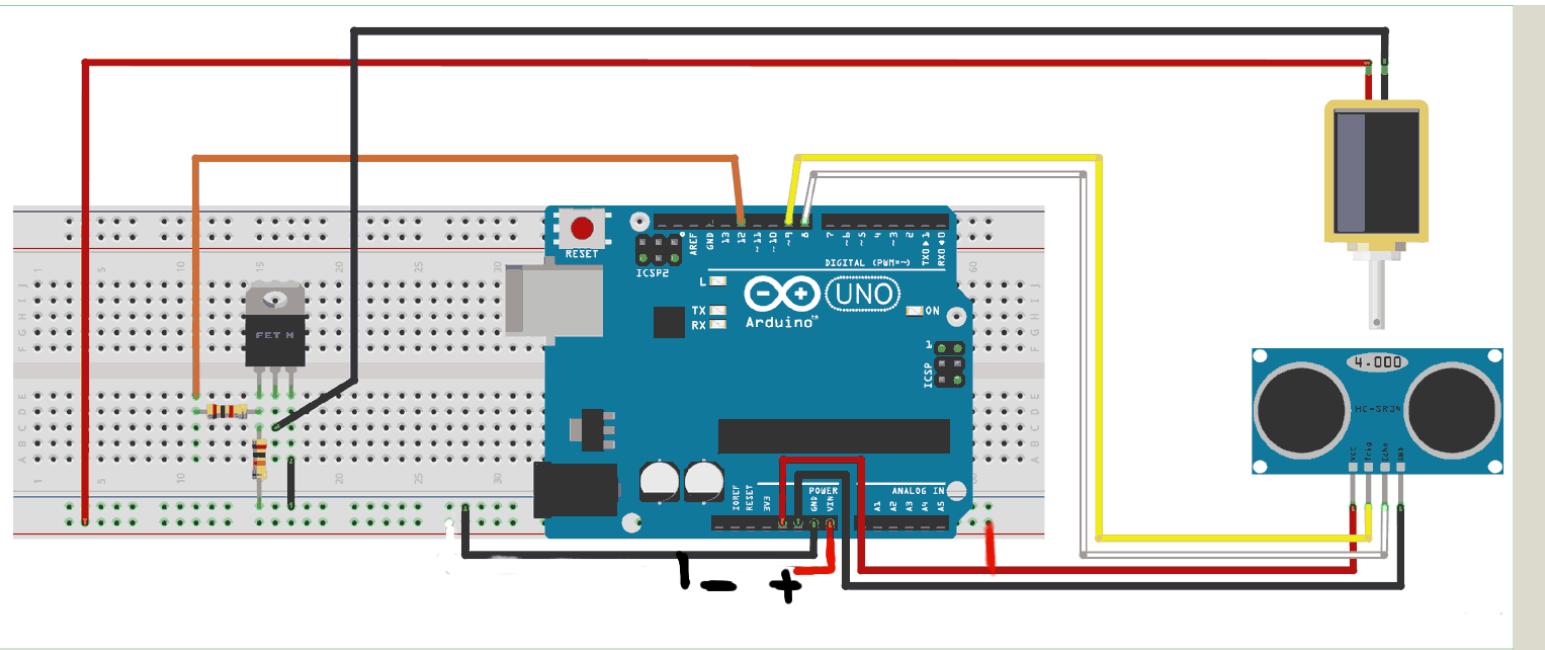
As we know an Arduino is a Development board which operates with 5V and hence we need a switching driver circuit for the Pump to turn it on and off. The switching device used in this project is the IRF540N N-Channel MOSFET. It has the 3 pins Gate, Source and Drain from pin 1 respectively. As shown in the circuit diagram the positive terminal of the Pump is powered with the +5V pin of the Arduino. The negative terminal of the solenoid is connected to the ground through the MOSFET's Source and Drain pins. So the pump will be powered only if the MOSFET is turned on.

The gate pin of the MOSFET is used to turn it on or off. It will remain off if the gate pin is grounded and will turn on if a gate voltage is applied. To keep the MOSFET turned off when no voltage is applied to gate pin, the gate pin is pulled to ground though a 10k resistor. The Arduino pin 12 is used to turn on or off the MOSFET, so the D12 pin is connected to the gate pin through a 1K resistor. This 1K resistor is used for current limiting purpose.

The Ultrasonic Sensor is powered by the +5V and ground pins of the Arduino. The Echo and Trigger pin is connected to the pin 8 and pin 9 respectively. We can then program the Arduino to use the Ultrasonic sensor to measure the distance and turn on the MOSFET when an object is detect. The whole circuit is simple and hence can be easily build on top of a breadboard.

Programming the Arduino Board:

For this project we have to write a program which uses the HCSR-04 Ultrasonic sensor to measure the distance of the object in front of it. When the distance is less than 10cm we have to turn on the MOSFET and else we have to turn off the MOSFET. We will also use the on board LED connected to pin 13 and toggle it along with the MOSFET so that we can ensure if the MOSFET is in turned on or off state.

The program starts with macros definition. We have the trigger and echo pin for the Ultrasonic sensor and the MOSFET gate pin and LED as the I/O for our Arduino. So we have defined to which pin these will be connected to. In our hardware we have connected the Echo and Trigger pin to 8 and 9th digital pin respectively. Then the MOSFET pin is connected to pin 12 and the onboard LED by default is connected to pin 13.

Inside the setup function we declare which pins are input and which are output. In our hardware only the Echo pin of Ultrasonic(US) sensor is the input pin and rest all are output pins. So we use the pinMode function of Arduino to specify .

Inside the main loop function we call for the function called measure_distance(). This function uses the US sensor to measure the distance of the object in front of it and updates the value to the variable 'distance'. To measure distance using US sensor the trigger pin must first be held low for two micro seconds and then held high for ten microseconds and again held low for two micro seconds. This will send a sonic blast of Ultrasonic signals into the air which will get reflected by the object in front of it and the echo pin will pick up the signals reflected by it. Then we use the time taken value to calculate distance of the object ahead of the sensor.

Once the distance is calculated, we have to compare the value of distance using a simple if statement and if the value is less than 10cm we make the MOSFET

and LED to go high, in the following else statement we make the MOSFET and LED to go low.

Working Of Automatic Water Dispenser:

Make the connections as shown in the circuit and upload the below given program into your Arduino board. Make some simple arrangement to connect the Pump to the water inlet and power up the circuit using the 7-12V battery or any other source. Make sure the on board LED is turned off, this ensures that the Pump is also off.

As you can see I have placed the Ultrasonic sensor directly below the solenoid valve such that when the glass/tumbler is placed below the solenoid it gets directly opposite to the ultrasonic sensor. This object will be sensed by the ultrasonic sensor and the MOSFET along with the LED will turn ON thus making the Pump on and the water flows down.

Similarly when the glass is removed the ultrasonic sensor tells to the Arduino there is no glass in front of it and thus the Arduino deactivates the pump.

Code can be referred to the other Document.......