Mini Project Report Cover Sheet

SRM Institute of Science and Technology
College of Engineering and Technology
Department of Electronics and Communication Engineering

18ECC206J VLSI DESIGN

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Title of the project : Smart Water Basin

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Mark split up ↓	Maximum Marks	Marks obtained	Marks obtained	Marks obtained
Novelty in the project work / Abstract	**5**			
Level of understanding of the design / Configuration	**10**			
Individual Contribution to the project	**5**			
Report writing	**5**			
Total	**25**			

REPORT VERIFICATION

Lab supervisor Signature with date :

SMART WASHBASIN ON LTSPICE

OBJECTIVE

Smart wash basin which is on home automation

SOFTWARE DETAIL

LTspice is a SPICE-based analog electronic circuit simulator computer software, produced by semiconductor manufacturer Analog Devices (originally by Linear Technology). It is the most widely distributed and used SPICE software in the industry. Though it is freeware, LTspice is not artificially restricted to limit its capabilities (no feature limits, no node limits, no component limits, no subcircuit limits).

A time domain transient analysis is where a parameter such as a voltage or current is plotted against time. If we are looking at an output, we can see the behavior over a specified length of time. For this example, we are going simulate the output of a half-wave rectifier. For this type of analysis, we will cover how to add an AC signal source to your schematic and choose a specific diode.

INTRODUCTION

In this busy world everybody is interested in making their routine works automated and also want to monitor the elderly people and patients at home. One of the routines works at home is Plant watering and is very important when the people leave the home for vacation or emergency as the plants may end up drying due to lack of water. Helping the elderly and disabled people to control the taps for their daily activities is also a challenging job.

Smart wash basin has an automatic water tap that will automatically pour water when you place hands underneath the outlet.

Save water, no need to worry about closing tap. This untouched tap also prevents germs and viruses to spread and improves hygiene. In today's situation of covid it can be helpful.

Smart wash basin which is a home automation. Many times, it happens that after washing our hands. We forget to switch off the tap which leads to wastage of water.

In addition to this functionality our own contribution is that it also has a water level indicator.
If you put the stopper at the basin to fill it to wash the objects or for a baby wash, water level indicator will be helpful for overflowing problems and how much water you require and again not wasting it.

The automatic water tap work on an infrared based system which will detect interruption of infrared rays from hands or any objects like utensils, bottles etc., and will power water from the faucet on the object.

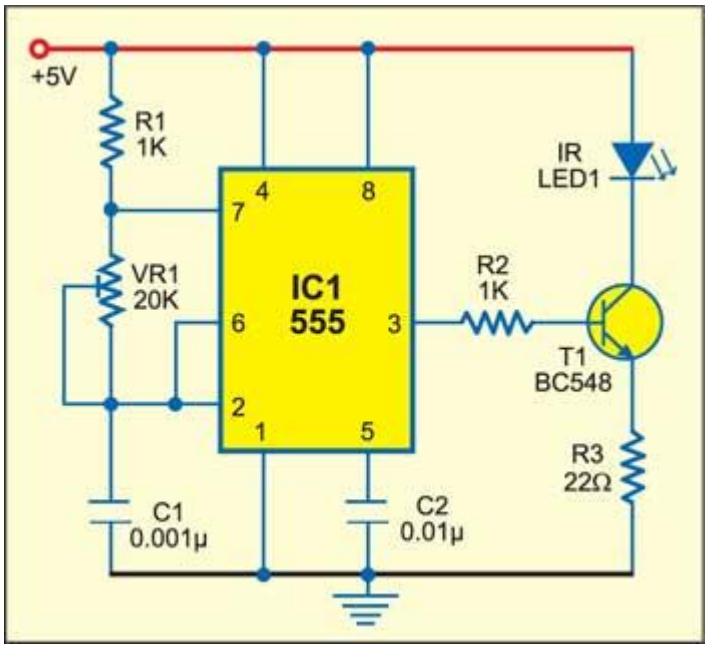
For the water level indicator when the circuit will be complete according to the level that LED will glow to indicate the user. In all the above functionality the transistor is working as a switch.
Now coming to the circuits, we have used LTSpice software because we find it very interactive and also using this software. We can check each of the node of our circuit to verify its functionality.

So, the coming to the circuit, we have used Timer 555 IC. Transistor is acting as a switch. So, now we are simulating the circuit.

So, this is a capacitor voltage or the input voltage which triggered the Timer 555 IC and the ttl output is given to the transistor which switches on and here we can see that we have considered the discharging of the capacitor as the interruption of the IR rays. So, we can see that when there's interruption of the IR rays the transistor switches on and there's a 12 volts output. This 12-volt output can be given to the relay which will open the water valve and water will pour from the faucet on your hands.

In this competitive world everyone is busy in their official works and other personal works so that they don't have sufficient time to complete other works at home such as plant watering and other works. Everybody is also interested in making their work automated. Automation of the home, housework or household activity is called Home automation. People may be interested in control of lighting, control of air conditioner and heating appliances, security locks of gates and doors and other systems. Home automation helps to provide improved convenience, comfort, energy efficiency and security. Home automation plays a vital role in the life of the elderly and disabled. They can be more independent and lead good quality of life who might otherwise require caregivers or institutional care. With the popularity and familiarity of smart phones and tablets among common people the concept of home automation has been increased greatly in recent years and also giving a great relief to the caregivers. The integration of Internet of Things with Home Automation has added to the functionality of Home Automation. The main motivation for this project is to give the elderly people, handicapped and patients a safe and independent living by providing the tap automation in the smart home. In this project we are also showing how the taps present in the home, office, shops etc. can be controlled. A low-cost smart home environment for remotely monitoring and helping the elderly people and patients in their everyday life activities is presented here.

BLOCK DIAGRAM



PROGRAM

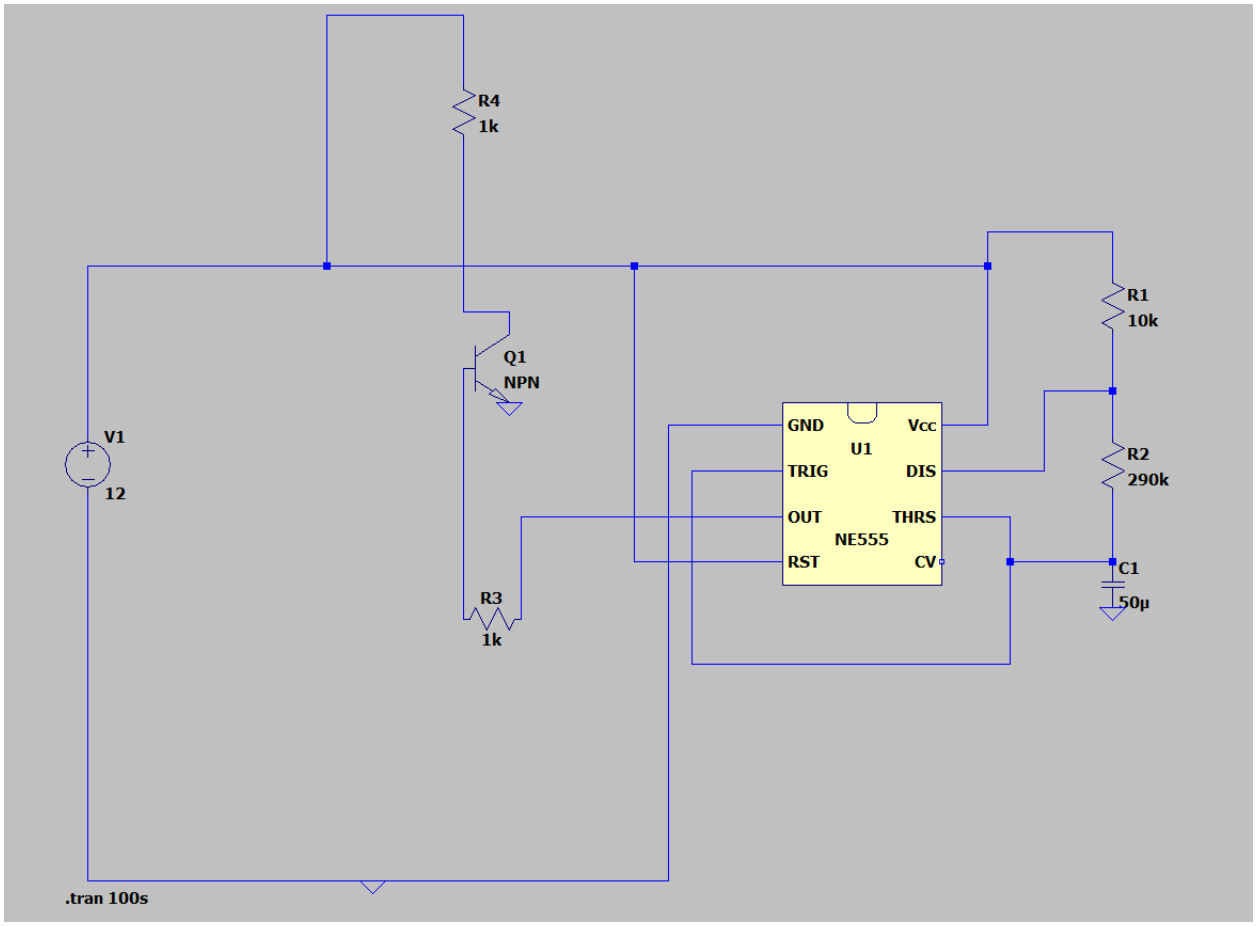
- INFRARED BASED SYSTEM
- TRANSISTOR AS A SWITCH
- TIMER 555 IC

SIMULATION RESULT

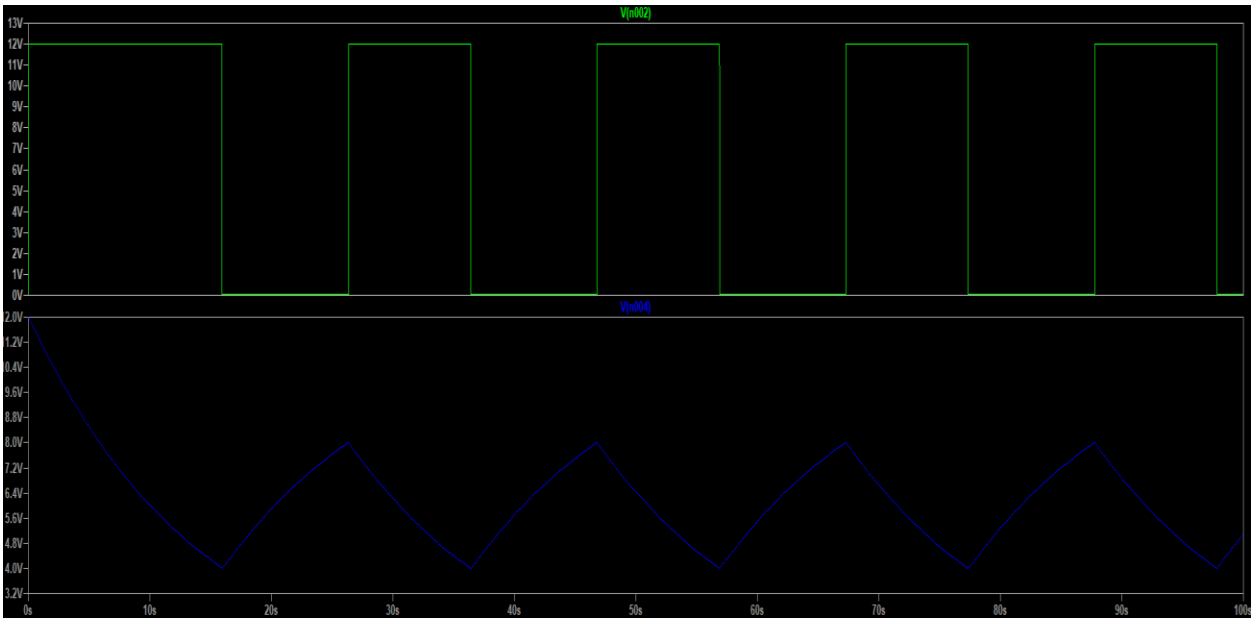
The circuit is built around 555 timers and comprises transmitter and receiver sections. Both the transmitter and the receiver work off 5V DC. The IR rays continuously emitted by the transmitter fall on the receiver. As soon as an obstacle comes in between the receiver and the transmitter, interrupting the IR rays, the output of the IR sensor goes low momentarily to trigger the timer circuit in the receiver and water comes out for a few seconds through the tap.
The resister R2 = 290k controls the delay of the circuit. If we decrease or increase the R2 value, on and off time changes accordingly.

Use shielded wires or leads for installing the IR LED and the IR sensor at opposite sides of the washbasin. Install the IR LED and IR sensor around half a metre apart such that the IR rays transmitted by the IR LED directly fall on the IR sensor. Now switch on the power supply to the circuit. When you put your hands between the IR LED and IR sensor, the relay energises to make the solenoid open up the valve and water flows out of the tap.

CIRCUIT DIAGRAM:



SIMULATION OUTPUT:



ADVANTAGES

- **Water conservation**: Finding ways to save water is very important. Electronic taps are usually designed with a low flow rate, an aerator in the spout and system or materials that prevent leakage. For instance, while traditional basin taps pour between 10 and 15 litres per minute, LTSpice smart basin taps would not use more than 6 litres and their solenoid valve is closed by default (and placed before the hose, which in this case supports up to 15 bar). Bear in mind that a dripping tap can waste between 300 ml and 1 litre per hour.

- A small office of just 7 people could save 12378.60 litres of water a year installing automatic taps, the equivalent of 155 full baths.

- **Energy saving in the long term:** Each smart basin tap requires 6, 9 or 12 volts, depending on the brand. This expense is unavoidable, whether hardwired or battery operated. Nonetheless, e-taps can make a difference during activation. Selecting the preferred flow and temperature every time a traditional faucet is activated wastes energy, among other things. In this regard, automatic basin taps with a constant temperature (cold, warm or premixed) are a great choice for commercial washrooms. Likewise, thermostatic faucets would be more energy efficient in showers than mixer lever ones.

DISADVANTAGES

- Price range is wide and, as always, you usually get what you pay for, but smart basin taps probably imply more initial investment than traditional taps, plus a remote control is necessary to change the default settings. Nonetheless, touchless tapware saves costs in the long run, especially for commercial washrooms, and just one remote control can adjust an infinite number of compatible automatic taps.
- If there is a water cut, one cannot use the faucets. If there is a power cut, mains operated smart basin taps will not work either. Nevertheless, let's count how many times a year business face power cuts or what the chances are that users go into a commercial washroom during a blackout, let alone reaching the basin.
- Hands free taps work with an infrared sensor. This widget may have problems with reflective surfaces and extremely bright colours. Installers must read carefully the mounting instructions that the manufacturer provides in order to avoid mirrors or polished chrome finishes opposite the tap sensor, as well as another built-in sensor right in front of it. Despite following the guidelines, beware that sensored taps can make activation mistakes from time to time.

APPLICATIONS

- Electronic taps have quite a lot of objective pros: environmentally friendly, cost saver in the long term, with constant flow and accessible to all users. However, one must think as well about their so-called cons and the particular variables such as the traffic of the washroom (is the initial investment worth it?) or location (for example, are there plugs in the premises?).

- We advise you to **analyse the options** in the automatic tap market paying attention to specifications like the type of power supply, water pressure, flow rate or maximum temperature. Usually, it provides sensor taps for basins, both wall-mounted and deck-mounted, mains or battery operated, made by the world's top manufacturers, with high quality components and contemporary design.

- The Smart Washbasin first focuses on detecting the presence of a person — if no one is detected nearby then it checks whether the tap is leaking or if the sink is blocked and if it is, then it sends out an alert. The water that comes out from the basin is called 'hai grey water' and has the potential to be recycled. "So, in the Smart Washbasin we have made an attempt to recycle the water and reuse it in toilets, gardens etc. It's still in the crude stage but has the potential to be implemented on a larger scale and can be improved further for the conservation of more and more water.

CONCLUSION

The smart home application developed is a flexible and effective system which is helpful in everyday life especially for physically handicapped, patients and elderly people. It is also helpful in conservation of water, which can be efficiently implemented in gardens, parks etc. This application also provides the security as the valid user need to provide the authentication requirements in order to use it. The smart home system application designed can be integrated with existing smart home systems so that it can be implemented in the large scale and more efficiently. This can be done my adding additional sensors and the LTSpice to the existing system. Integrating this system to the camera-based video surveillance will be of a great help to elderly people and patients. The camera-based video surveillance helps to visually monitor the daily activities of elderly people and patients. After visually monitoring the activity this LTSpice can be used to control the taps for the help of elderly people.

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