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# IOT BASED SYSTEM DESIGN FOR DETECTING URINARY BLADDER LEVEL

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**Abstract**—Under different neurogenic conditions patients may suffer from lack of Bladder fullness sensation which drastically affects patient's quality of life and may even lead to serious kidney damage. To help the patients to void voluntarily and resolve the problem of enuresis several methods were proposed. This paper aims in designing a Non-invasive sensor for bladder fullness sensation and alerting them about the bladder fullness. The urinary continence subject was studied by designing a sensor. The measurement was first made invitro using phantom solution, which simulates the bladder fullness .The Differences in the detected output signal for before (full) and after(empty) voiding in patients was estimated.

## I. INTRODUCTION

The main role of the bladder is for the collection and expulsion of urine. At birth the bladder stores and discharges urine in a rhythmic manner which is independent of central cortical control. During the first five years of life this pattern comes under voluntary regulation, particularly during a Period of adult supervision and during biofeedback known as training.

**BLOCK DIAGRAM**

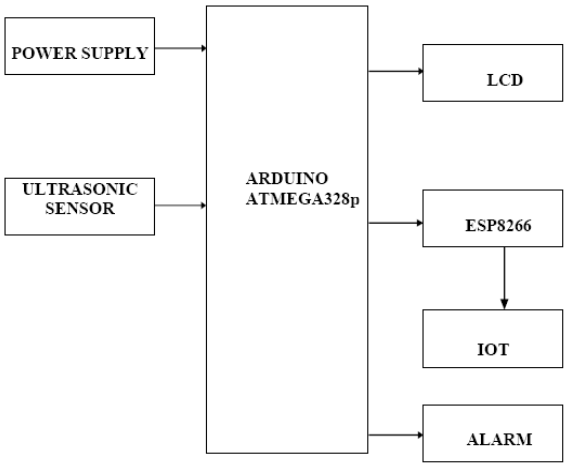


FIGURE: 1.1 Block Diagram of Urine Level Detector



 

Similar methods are used in the treatment of incontinence. The majority of the normal bladder cycle is spent storing urine at increasing volumes with a continuously low intravesical pressure which gradually results in central awareness. Normal adult bladder function is characterized by quiescence of the parasympathetic efferent pathways and absenceof involuntary bladder contractions during the filling phase. In addition, the pressure in the bladder remains low during filling because of the almost infinite compliance of the bladder until capacity is increased. This is largely achieved by the arrangement of detrusor muscle fibers, reflex inhibitory pathways and the absence of connective tissue restriction, particularly by collagen. To have control over urination ,the bladder muscles and other parts of urinary tract, the nerves controlling the urinary system, the ability to feel and respond to the urge to urinate. Transcutaneous monitoring over the bladder as it fills and empties provides unique

## II. ELECTRONICS

The hardware consists of a device that is worn by the subject on the abdominal skin. The block diagram of the sensor is shown in Fig.The sensor is made using commercially available components on a printed circuit board and is enclosed in a custom made 3-dimensionally printed enclosure. The source LED and the detector are mounted using standard surface mounting technology.

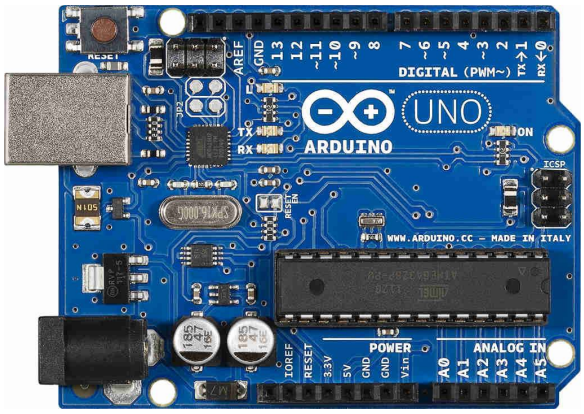


FIGURE: 2.1 ARDUINO UNO

The Arduino Uno is a microcontroller board based on The ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome..LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

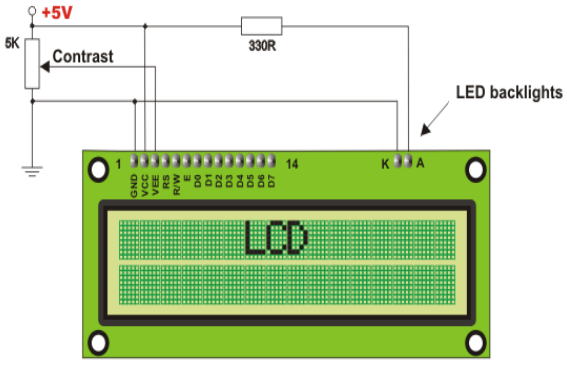


FIGURE: 2.2 LIQUID CRYSTAL DISPLAY

## III. ULTRA SONIC SENSOR

The Ultrasonic Sensor sends out a high-frequency sound pulse and then times how long it takes for the echo of the sound to reflect back. The sensor has 2 openings on its front. One opening transmits ultrasonic waves, (like a tiny speaker), the other receives them, (like a tiny microphone).A chirp is emitted from the "speaker."



 

It bounces off of an object. The echo returns to the microphone. The time it takes to travel to the object and back is used to figure out level

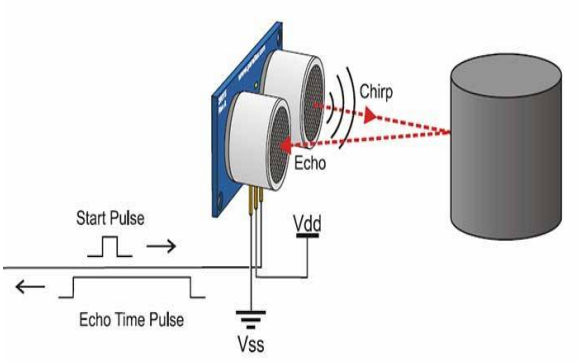


FIGURE: 3.1 SENSOR WORKING DIAGRAM

## IV. WIFI- ESP8266

This is Wi-Fi serial transceiver module, based on ESP8266 SoC.The SOC has Integrated TCP/IP protocol stack. ESP8266 is a highly integrated chip designed for the needs of a new connected world. It offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application processor. ESP8266 has powerful on-board processing and storage capabilities that allow it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

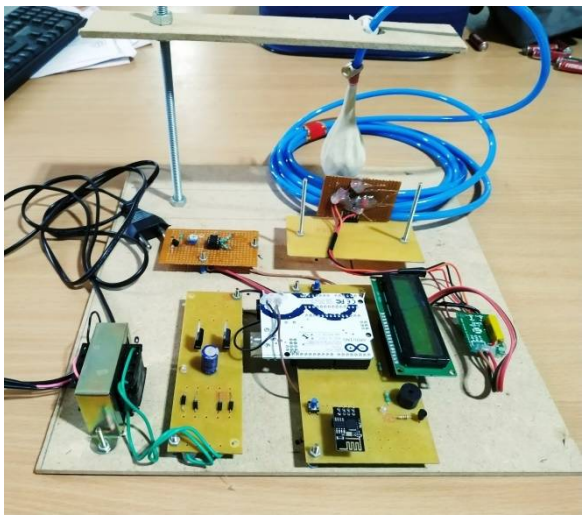

FIGURE: 4.1 DESIGNED SYSTEM

## V. CONCLUSION

The method proposes a compact device for continuous non-invasive monitoring of the bladder in patients who are unable to sense when their bladder is full. This is a significant clinical problem in individuals with abnormal (neurogenic) bladder function, such as patients affected by stroke and/or spinal cord injury, elderly patients with incontinence, and children with persistent enuresis. The device is capable of differentiating between when the bladder is empty or contains a small volume of urine and when it becomes full. As a future work, with such a device used as a sensor with an alarm, it is hence feasible to warn the subject when the volume of urine in his/her bladder reaches a pre-determined threshold of the bladder capacity. This would potentially enablepatients a risk for urinary retention to protect themselves from renal damage, elderly subjects prone to incontinence to retain the ability to void voluntarily, and children with problematic enuresis to become conditioned to when they need to wake to void. In later development phases, the capacity value can be defined for individual patients, and the fullness and position of the bladder beneath the abdominal skin such that this volume corresponds to can be assessed by ultrasound.



 

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