Urine Stress Alert System Device for Children and Paralyzed Patient using IoT

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ABSTRACT

The aim of the work is to develop a smart IoT based urine stress alert system for children and paralyzed patient. This is prepared for children and paralyzed patient those who are incapability of walking and unable to go in the toilet. It also helps for the people who can't speak frequently. The device is working as an assistant for the paralyzed patient who admit in the hospital.

Authors have used own proposed model in methodology part. There are no ambiguous requirements; all requirements are clear and fixed. Requirement analysis has done to show all the hardware and software requirements needed for the system development. The microcontroller unit is programmed using C++ programming language to develop the system. This system will help to children and paralyzed patient those who are incapability of walking and unable to go in the toilet.

Keywords: Children, Paralyzed, Patient, Urine Stress, Notification alert, IoT

1 INTRODUCTION

Urine stress alert system for paralyzed patient and children is prepared for children and paralyzed patient those who are incapability of walking and unable to go in the toilet. It also helps for the people who can't speak frequently. The device is working as an assistant for the people who admit in the hospital. In this system there is a GSR sensor device that will be track down the urine stress of paralyzed people and children. It also have an alert system that will generate alarm when the patient realized by urine stress. It's also have a display system that will show the stress level. Here used Arduino Uno R3-(China), Grove GSR sensor Buzzer, 2's li-on battery, OLED display and Male to male jumpers. In Bangladesh day by day increase the number of birth rate and paralyzed patient also. So it is necessary to monitor automatically the urine stress of paralyzed patient and children.

Statistics of paralyzed people in Bangladesh (reference**:** www.crp-bangladesh.org)

Year	Paralyzed people in Bangladesh
In 2015	15,000
In 2016	10,000
In 2017	12,000
In 2018	20,000
In 2019	25,000

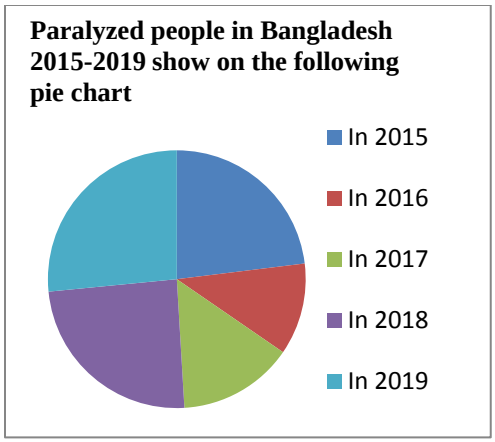

Figure 1: Mortality rate of paralyzed people in last 5 years

In the source of CRP (Centre for the Rehabilitation of the paralyzed) now more than 76,000 people are affected in paralyzed in Bangladesh. While starting for the journey most of the paralyzed patient and children are nursed by others family member or professional nurse. Here used a GSR sensor to the paralyzed patient and children's finger. Also used Arduino, OLED Display, Mini breadboard, Buzzer, Male to male jumpers and 2s li-ion battery.

2 OBJECTIVES

1. To measure the urine stress of the paralyzed patient and children.
2. To automatically generate alarm and notify to the nurse if the urine stress level crossed the level of saturation.
3. To count down urine stress level and also measure the number of urine per-day.

3 JUSTIFICATION OF STUDY

Disability/paralysis is now one of the major health and social issues in Bangladesh. To achieve such goal it is very important to know the prevalence of disability, the type of disability that is more prevalent, the part of the country that is more prevalent to a specific type of disability and the age and socioeconomic groups that are likely to have disability. For example, if the correct distribution of disables by type of disability is identified then it would be easier for national policy makers to design and implement the specific program aimed at providing services for disables with respective disability. Similarly by identifying the most prevalent socio-demographic groups and geographic areas the government and international agencies can give special attention to those groups and areas for quick improvement in the process of social and economic inclusion of the people with disability. In addition to strengthening the existing disability movement and implementing disability law aimed at establishing socioeconomic and political rights of a person with disability, it is essential to know the extent to which the disabled people have access to the social and economic activities.

The current birth rate for Bangladesh in 2020 is 17.714 births per 1000 people, a 1.8% decline from 2019. So a large number of children birth every day in Bangladesh. Most of the children nursed by their mother or others family member. Children and paralyzed patient those who are incapability of walking and unable to go in the toilet and also who can't speak frequently this device help them so much.

4 SCOPE OF STUDY

Our medical treatment system can be used for monitoring different types of patients along with paralyzed patients and children.

Anyone can use it for their children or older people in the house.

4 BACGROUND STUDY

Bangladesh has thousands of death by paralysis. And also a large number of family members are suffered by paralyzed patient. In the report of UNICEF 1 January 2019, around 8,428 babies born in new year's day. That's mean large number babies born every day in Bangladesh. As a result it's very important to nurse paralyzed patient and children by automatically.

4.1 LITERATURE REVIEW

We have studied various websites, articles, and reports about paralyzed patient and children monitoring system. At the best of our knowledge, paralyzed patient and children's urine stress alert system device has not done in Bangladesh yet. Not only Bangladesh but also all over the world but many techniques have been developed to eradicate this problem.

Urinary Incontinence: Its Assessment and relationship to Depression among community-dwelling multiethnic older women (D.William Bloom and A. Ainsworth 2014). Urinary Incontinence (UI) is a pelvic floor disorder leading to an involuntary loss of urine that commonly affects older adults. Of the 23.7 percent of women in the United States of America (USA) living with a pelvic floor disorder, 15.7 percent of cases are accounted for by UI, with prevalence rates among older women between 23 and 31.7 percent. With some estimates of undiagnosed UI in women placing prevalence rates as high as 50 percent, the economic ramifications of this condition are vast, with direct cost estimates in the USA exceeding $12 billion dollars. Along with the monetary ramifications of UI, there are a number of psychosocial consequences associated with this disorder affecting both sufferers of UI and their caregivers. Some of the deleterious syndetic and comorbid consequences of UI include sexual dysfunction, stress, major depression, diminished quality of life, and familial discord. With USA census population projections estimating that one in every five women will be over the age of 65 by 2020, more research on health concerns prevalent within this population is needed in order for health professionals to better assess the needs and resources required to successfully accommodate, care, and treat older women.

Cough stress tests to diagnose stress urinary incontinence in women with pelvic organ prolapsed with indication for surgical treatment (M.Espuña-Pons, I.Diez-Itza2, S. Anglès-Acedo3 & Patrick J. O 2020). Pelvic organ prolapsed (POP) is frequently associated with urinary disorders, such as stress urinary incontinence (SUI), urgency/urgency urinary incontinence, and voiding dysfunc- tion/urinary retention. The majority of women with POP and urinary incontinence have symptoms of mixed urinary incontinence.

1. These disorders may improve or resolve after POP surgery, with the level of success depending on patient characteristics and type of surgery.
2. The cough stress test (CST) is recommended in the evaluation of female patients to identify the signs of SUI and is used as an outcome measure following SUI treatment. The patient coughs and is observed for urine loss synchronous with the cough. If the patient leaks with the onset of the cough and terminates with its cessation, the test is positive and confirms the presence of SUI.

3. Recently, the International Continence Society (ICS) has provided guidance on the CST with the introduction of the ICS Uniform Cough Stress Test (ICS-UCST), and an ICS education module has been developed to standardize the performance and reporting of the CST used in the clinical and outcome assessment of women with urinary incontinence.
4. When compared with multichannel urodynamic evaluations, the CST demonstrates good sensitivity and specificity for SUI.

Stress Urinary Incontinence Relative Importance of Urethral Support and Urethral Closure Pressure (J,O. L. DeLancey, E.R. Trowbridge2, J.M. Miller3 & D.M. Morgan 2008). Urinary incontinence is the most prevalent pelvic floor disorder and responsible for silent suffering and social ostracism. Treatment costs reach 16 billion dollars annually. Stress urinary incontinence is the most common type of urinary incontinence affecting 86% of incontinent women either alone (50%) or in conjunction with urge incontinence (36%).

Despite the prevalent nature of this troubling condition, important gaps in our understanding of causal mechanisms limit development of new treatments and prevention strategies. Most current interventions focus on the surgical improvement of urethral support as the primary therapeutic target. Less attention has been focused on understanding factors affecting urethral closure pressure and treatment strategies aimed at this therapeutic target. Although surgical improvement of urethral support is clearly effective, careful outcome analysis reveals that 20% of women treated in this way still have a positive pad test 2 years after surgery and still complain of stress incontinence.

The hypothesis that urethral support is the predominant causal factor in stress incontinence has not been properly tested. Studies assessing both urethral support and sphincter function have been inconclusive in part because control subjects were mainly symptomatic incontinent women referred for urodynamic evaluation that did not demonstrate stress incontinence during testing. The ROSE Study (Research on Stress Incontinence Etiology) sought to compare measures of each element of the stress continence mechanism in matched cases and asymptomatic controls.

5 METHODOLOGY

The Methodology is mainly the set of methods, rules and a particular procedure or set of procedures for gain proposed model's objectives. This project work has completed by following these steps. Diagrammatic representation of some steps is given below:

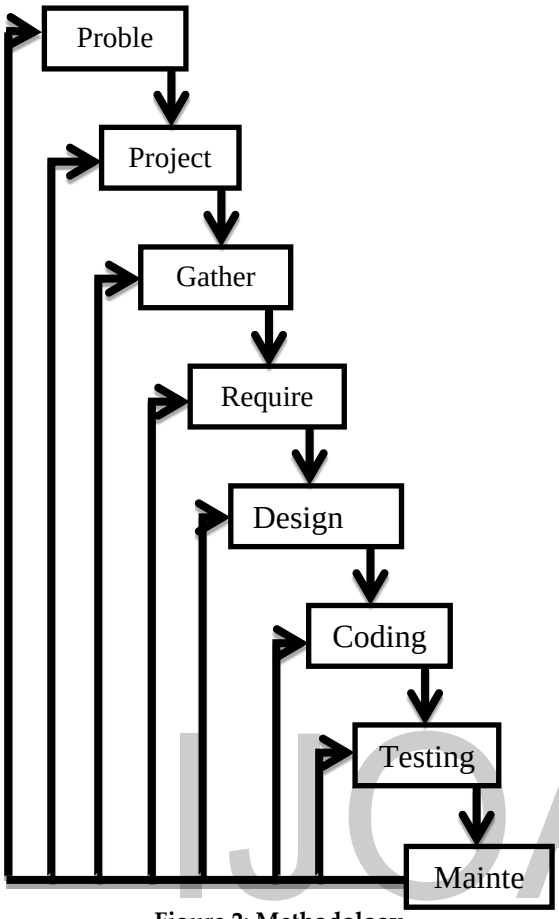

Figure 2: Methodology

5.1 JUSTIFICATION of METHEDOLOGY

The full process of the proposed work is divided into different steps. We have chosen each step very sincerely to ensure its accuracy and it drives efficiencies into every steps of this process. We have collected all possible requirements of the proposed system to be developed are very good documented. There are no ambiguous requirements; all requirements are clear and fixed. There are lots of resources to support this proposed system.

5.2 DESCRIPTION of METHEDOLOGY

The main target of the proposed system is to design and developed urine stress alert system for paralyzed patient and children using loT for reduce time and coast. This proposed system divided into some steps.

Problem Structuring: At first, we have decided to search a specific problem based on the current city of Bangladesh by which authors can design and developed a perfect solution for the problem.

Project planning: Project planning is a guideline to decide how to complete a project within a certain time period, with defined stages. In this stage, the selection of how to done this project and makes a decision about which project will done. We have discussed about the whole work of this proposed system.

Gather Information: By gathering information and knowledge can be identified problem and that can be solved. In this step we have research and collect knowledge from internet, books, papers, and previous related works and also collect information from various people of related this problem.

Requirement Analysis: In this step, we have to need some hardware requirements for developed the project. By researching these hardware, these can be help to develop this proposed system. Such as, we have to need Arduino, GSM Module, IR Sensor, Buzzer, LCD Display, Capacitor, Resistor, Battery, RAFID Module, Transformer, and Rectifier for developed this proposed system.

Design and Development: The main objective of this step is design and develops a hardware device. In design part, we have designed various diagrams, for example flow chart, system architecture, circuit diagram, block diagram etc. In development part, we have developed the devices which will create a urine stress alert system for paralyzed patient and children. This device sends an alert to the family

member or nearest nurse or doctor control room when urine stress detection for paralyzed patient and children. If urine stress is found from the paralyzed patient and children then suddenly send an alert message to the family members or nearest doctors control room. By receiving this alert message from these device family members or nearest doctors control room get an action.

Coding: For this proposed system we need to know about, Hardware connection, C++ language, and Arduino IDE.

Testing: Testing means checkup the overall work in this part, we have tested this proposed system using several test modules. We have tested the proposed system using children to get a urine stress alert message when these children get a pressure of urine stress.

Maintenance: This proposed project maintenance represents the full scope and the understanding of how the function should operate and manage in an implementation area. Sometimes issues could be created from users. Maintenance is done to the changes in the system to support users and monitor system performance.

Requirement Analysis

Requirements analysis is the procedure of defining the expectancy of the users for the system that is to be modified. Requirements analysis involves with all the hardware and software of the proposed system. Mainly, requirements analysis describe to analyze, verify and manage software or hardware requirements. In software or hardware engineering, these requirements are called functional specifications.

Hardware Requirements

1. Arduino UNO-R3(China)
2. Grove-GSR sensor
3. OLED Display Blue I2C 128×64 0.96″
4. Mini breadboard
5. Buzzer
6. Male to male jumpers
7. 2s li-ion battery

Software Requirements

1. Windows operating system
2. Language C++
3. Arduino IDE

6 BLOCK DIAGRAM

A block diagram is diagram of a system in which the principal elements are represented by blocks that show the relationships of the blocks and which are connected by lines. All the components are connected with microcontroller and they are acting as input or output devices.

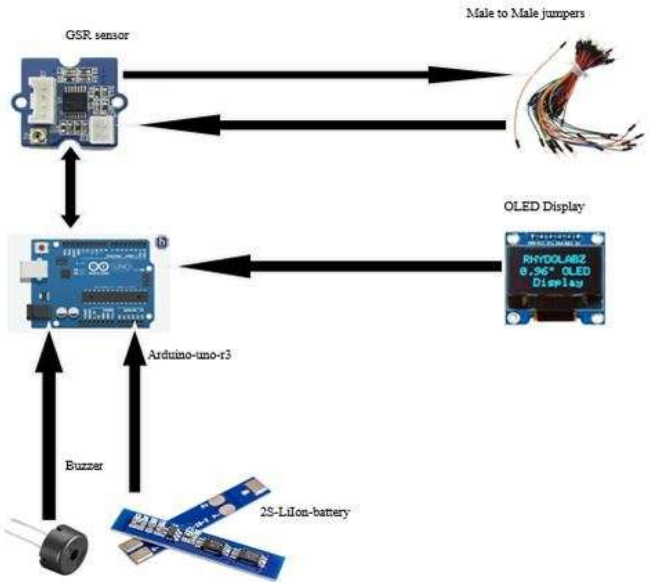

Figure 3: Block Diagram of the proposed system

7 CIRCUIT DIAGRAM

A circuit diagram is a graphical representation of an electrical circuit diagram show how electronic elements are connected along.

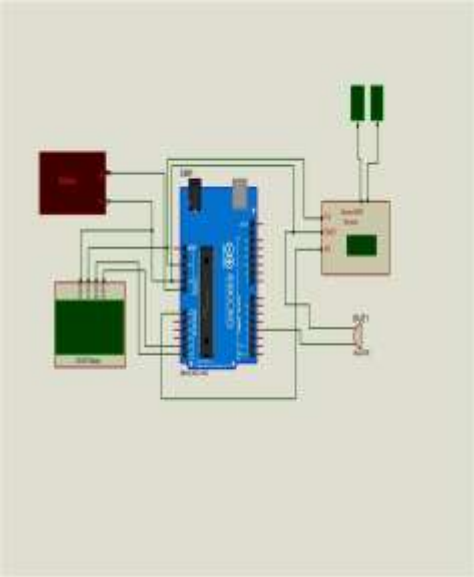

Fig 4: Circuit Diagram of the proposed system

8 FLOW CHART

A flowchart is a pictorial representation of a process. Flowchart is also outline of a problem solving technique step by step.

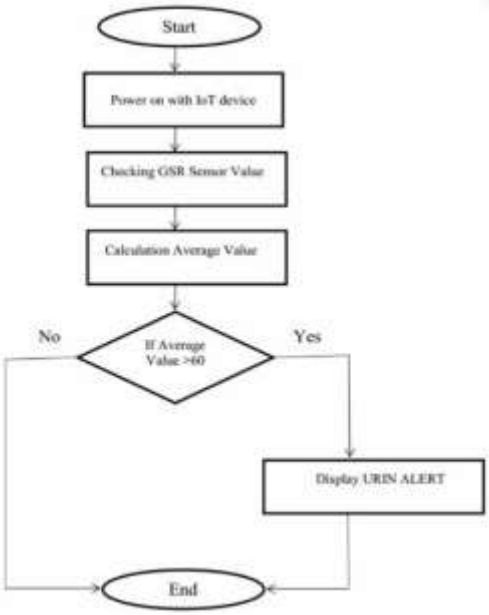

Figure 5: Flow chart of the proposed system

9 DEVICE PROTOTYPE

Figure 6: Device Prototype

The figure 5 Device prototype shows the proposed IoT device that is developed by using Arduino UNO-R3(China), Grove GSR sensor, OLED Display Blue I2C 128×64 0.96″, Mini bread board, Buzzer, Male to male jumpers and 2s-lion battery.

Over stress detection

Here GSR sensor get the urine stress value from paralyzed patient or children then OLED display show the stress value.

Urine stress detection by using GSR sensor

When GSR sensor found the stress value up to 60 (here 60 is built in value) then automatically show the stress value in OLED display and Buzzer can performed urine stress alert.

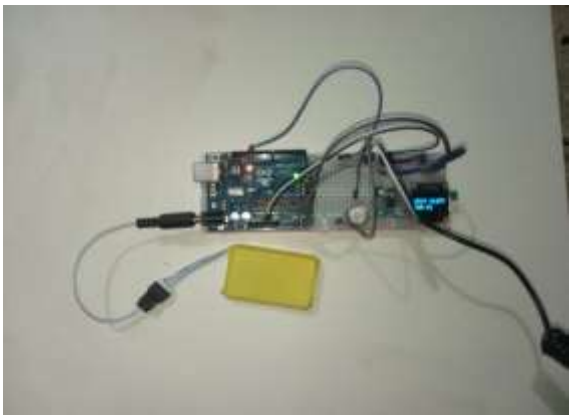

Figure 7: Urine stress value detection system

10 CONCLUSION

The proposed IoT device is very helpful for reducing the cost and working time of the family members of the paralyzed patient and children's parents. The proposed system has developed for monitor the urine stress detection system. The proposed IoT device can detect the urine stress and give us an alarm. The Grove GSR sensor has been used for measure the urine stress. The Grove GSR sensor has two electrodes which have insert on the paralyzed patient and children's finger. When the urine stress will come suddenly alarm the BUZZER.

After start the arduino, it can calculate the average of 500 analog value of pin A0. These average values are accumulated in to the Threshold variable. These Thresholds can comparison the every analog value of arduino, and can come to a conclusion that the BUZZER will alarm or not.

LIMITATIONS

1. Not able to maintain all the information of paralyzed patient and children
2. It gives some trouble sometimes while attaching to the body.

FUTURE WORKS

1. Can maintain all the information of paralyzed patient and children
2. Camera can be added to capture image view of the paralyzed patient and children
3. In future automatically a toilet system can be added with this IoT device.

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