Automatic water impurity detection and purification

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ABSTRACT:
One of the most pervasive problems afflicting people throughout the world is inadequate access to clean water and sanitation. Problems with water are expected to grow worse in the coming decades, with water scarcity occurring globally, even in regions currently considered water-rich. Addressing these problems calls out for a tremendous amount of research to be conducted to identify robust new methods of purifying water at lower cost. In our project we are representing the module of water purity detection and purification. Our main purpose is to remove unwanted constituents in the water and to make it safe to drink or fit for a specific purpose in industry or medical applications. We are making our system portable and compact in size, if a certain amount of impurity (which is to be set) is found in the water then the module will sense the impurity and will pure it.

Keywords: Filtration, automatic, purification, portable, compact

INTRODUCTION
Early warning systems (EWS) for water quality are becoming more frequently used by drinking-water purveyors and water-quality monitoring agencies. Most water-quality EWS detect water contamination events based on water-quality criteria. In other words, a water contamination event is declared when real-time water quality data are outside the expected range of allowable water-quality criteria, at which point an alert is issued. Such exceedance criteria event detection method, however, may overlook implicit information present in the water quality measurements and may cause a high false alarm rate[1].

Empirical evidence shows that water quality parameters, such as pH, conductivity, total or free chlorine and TOC (total organic carbon), are sensitive indicators of nicotine, arsenic trioxide, aldicarb and Escherichia coli contaminants. Motivated by this type of empirical evidence, a class of methods named anomaly-based water-contamination event detection has garnered increasing attention. A single water quality parameter, water-contamination events relies on the times series of residuals of water-quality parameters predictions and the use of weighted-averaging and time-dimension information to resolve conflicts or ambiguities that arise when attempting to detect water-contamination events. Such conflicts or ambiguities are named herein evidence conflicts.

Simulated and experimental water-contamination events of different severity are used to test the proposed approach for detecting water-contamination events[3].

Our system will be working like a portable water purifier. The system will be detecting the impurities which are type of physical and chemical impurities using the defined sensors. For the removal of physical type of impurities a layered filter will be used consists of different filtering stages and for chemical impurity removal RO (Reverse Osmosis) unit will be used. The system we are producing is totally portable and compact in size[3].

II. REQUIRED CIRCUITARY
It basically considers with a purification systems which consists of different filtering units, impurity sensing circuitry and DC pump for fetching the water to be processed. Whenever pouring of water into the system takes place, water gets collected into a container for impurity testing. Sensors are placed at the edges of the container. They sense the impurity and display the % impurity on the LCD display. Further fetching of water from the container is done towards filtering units. Sensors are interfaced with micro controller PIC18F4520 and the results of the respective sensors will be displayed on the display which is interfaced with the controller.

Processing of the water towards filtering units is managed using DC pump to provide enough pressure to the water so that it can pass through the filtering units with required speed. Sedimentation filter which removes hard particles from the water consists of layers of fine filters inside it. Sedimentation filter is followed by
Reverse osmosis unit. We are using activated carbon which is also called as activated charcoal. It uses adsorption property. Carbon adsorption has numerous applications in removing the contaminants in the water. Utilization of semi-permeable membrane in reverse osmosis unit plays an important role in removing hardness of the water. Although getting processed through all these units water is collected at the outlet of the purifying system.

**III. PORTABILITY**

In this project titled ‘automatic water purification and detection’ we are making it portable. Conventional method of purifying water required power supply circuit as well as 230V AC power supply, which does not makes it portable due to need of power supply.

In the situation where we don’t carry water and anyone is in need of water then it becomes a problem. So to avoid this situation, if there is a water source available nearby then this portable water purifier is useful. This is the major advantage of our project where we are making it portable by using 24V battery operated DC motor where all process of purification begins. The basic principle in purification by making it portable is that we pour water from above the unit where water is stored in a container and then accordingly the purification process starts by sensing various parameters as mentioned earlier, resulting in purification[2]

**IV. METHODOLOGY**

Though processing of water takes place in a step wise manner the architecture of the whole system is represented using block diagram which gives brief idea about how controller is interfaced with the system sensors and how it works.

As shown in the respective block diagram turbidity and solubility sensors are interfaced with the PIV18F4520 micro controller. Crystal oscillator of 12 MHz, manual reset, relay along with relay driver and 5v power supply is provided. Relay is connected to dc pump which is used to fetch the water. Then water passes through the filters undergoes several processing and at the outlet we get the pure water[4].

**V. RESULT AND DISCUSSION**

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<th>OUTPUT VOLTAGE</th>
<th>OUTPUT IN % VALUE</th>
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<td>3.80</td>
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Table. 1 Testing results of turbidity sensor

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Table. 2 Testing results of solubility sensor
CONCLUSIONS
Thus it allows to pass the turbid and impure water through the system and after passing through the filters it gives pure and drinkable water at the outlet. Turbidity and hardness is removed using respective filters to get pure water at the outlet. System is made portable so that it can be carried anywhere. Waste water is collected at the another output of the system. Percentage of impurity is displayed on the LCD which is interfaced with PIC18F4520.

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REFERENCES