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AN INVENTIVE AUTOMATON FOR SEWAGE CLEANING

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Abstract: Robotics is a fastest evolving technological field. The advancements of electronics and microprocessors allows for the creation of devices that combine mechanical structures, electronic devices and software tools. Cleaning drains and drainpipes is very challenging. Humans cleaning drainpipes and drains appear to be at risk of contracting infections or poisoning as a result of waste and chemicals in them. Excess waste can also overflow the drain causing a slew of problems for the environment. In order to solve the real time problems involved in cleaning the sewers by individuals, we present the idea of a robot to carry out the grunt work. IOT technology based drainpipe cleanup machine addresses the ongoing sewer blocking problems. A self operating sewage cleanup system allows the liquid waste to pass through. A node system will detect the fluid level, blockage, sewer lid position, and report on the server, thereby reducing the complexity involved in cleaning the sewers.

Index Terms: Arduino mounted robot, intelligent robot, sewage cleaning.

I. INTRODUCTION

Following George Devol's invention of the first robot in 1954, robotics has advanced swiftly in varied applications. Robots have a wide range of uses in military and industrial activities, allowing IoT and AI to save personnel. In recent times robotics has been used as a security and surveillance robots.

Wirelessly controlled self operated sewage treatment and management system is introduced to eliminate the actual problems involved in gutter cleaning. Cleaning and maintenance of drainage pits must be a priority issue to be addressed with the reason being "accumulation of large amount of industrial wastes in the local areas constantly. Our research introduces a wirelessly operating system to clear and regulate the level of gutter waste. The main supervisory unit is formed by a robotic device and wireless cleaning is carried out by district council.

The components used are string, hand wheel, operator device, bowl of water, and chassis. Therefore rather than performing cleaning task for entire drainage area the workers must only perform maintenance of the wireless robotic systems mounted at various locations. An aperture made of metallic teeth forms the base of system. The lateral chassis allows for wastewater to gush while collecting all garbage. A filtration unit forms the apex of the system. The aperture is raised at predetermined times by a motorized beam linked to it with the help of a string. When it hits the peak it flips downwards to unload the garbage. Upon disposing of garbage, the motor will rotate once more to return the aperture to the base position in order to gather further sludge. The system is one of the most effective approach towards cleaning of garbage deposits.

1.1 Objective

Major goal of this machine is to manage and perform the cleaning operation inside the drain by completely IOT automation it will save the environment from diseases. We intend to create a node by which we can monitor the drain fluid level, lid position and blockage from the workstation over a web server. We intend to provide a robot which must completely replace the human manual work for cleaning of drains.

II. LITERATURE SURVEY

[1]Expert management has been practiced in modern towns for quite some time. Sadly, wastewater strategic plan is by far the most underappreciated aspect of urban development and preparation. Sewage framework is often accomplished on the fly, frequently exercising power over sewage scheduling. To better recognize our municipalities' drainage problems, the Chaktai Commercial Area in Chittagong was chosen as a research location for additional investigation and interpretation. The said research project outlines the key circumstance, evaluating the reasons of the difficulties, wanting to know well about decision - makers' likes and dislikes, and trying to assess potential remedies like an important approach towards formulating strategic choices. It helps to identify the core principles for the full implementation of a sewer system into the town's master plan. [2] The latest quality support the robot theories provide is indeed of pipe clean up and safety checks. This paper describes a novel method for designing and developing cleaner's robotic systems in an unidentified pipe workstation. To that end, we invent a novel cleaning cutting technique and perhaps a submerged investigation technique. An interaction method that allows the automation system to traverse the drainage pipe is concentrated. Eventually, we run studies and real-world evaluations to assess the efficiency of the suggested investigation and cleanup procedures. We also use computational models to test the validity of the suggested system. [3]Numerous areas in energy plants, like containers, layer, and injector tubing, must be thoroughly checked and washed on a constant schedule. To preserve the accuracy of the energy station, such various locations should be investigated on a regular basis employing sensor module and graphic camera systems. Having to wash energy stations is a laborious task that requires significant period and staffing. The advancement of mobile automation and robotics enables the integration of droids to progressively difficult work. Drones were originally used in the automation industry to accurately manage recurring and simple tasks, with the goal of lowering manufacturing costs. The support automation industry has begun to expand in tandem with the greater pace of embedded microcontrollers. Robotic systems accomplish things like lifting hazardous radioactive heaps and conducting difficult repairs.

III. EXISTING SYSTEM

Structures designed specifically for cleaner robots have a small range. They can only be operated manually, requiring operator concern during the whole surveillance procedure. Selected camera is not capable of capturing images from far distances. Without automation system humans have to clean manually risking their life. Many times accidents happen and labors are washed away because of flow of water.

IV. PROPOSED SYSTEM

Proposed system implements a wireless cleaning and monitoring framework that can be controlled remotely using an Arduino mounted on a robotic chassis as well as a node that can monitor the level, lid and blockage in the drain. A mobile device or a laptop is used to manage the system from a remote location. Our robot consists of a pan tilt motor that rotates the camera in a way to provide the complete insight of the area where the robot is placed and a shaft fitted with gears will clean the drain using water pressure.

V. SYSTEM DESIGN AND IMPLEMENTATION

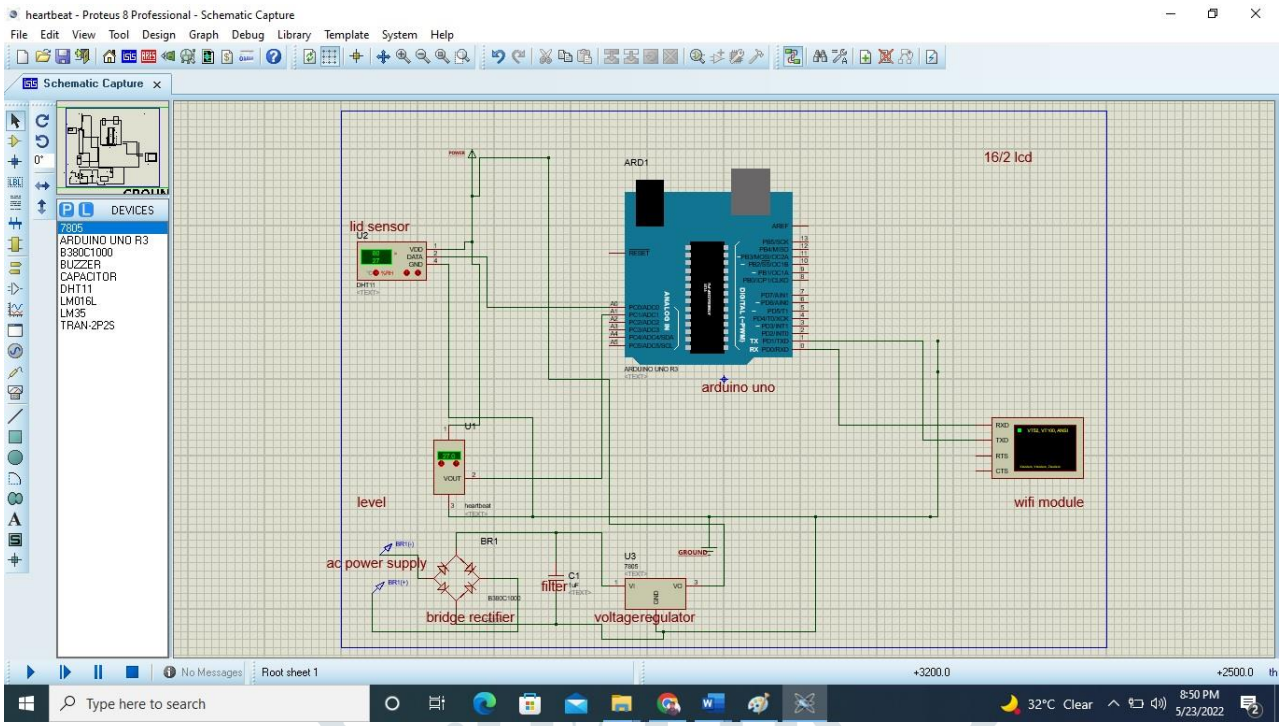


Figure 1: Schematic layout of drain monitoring system

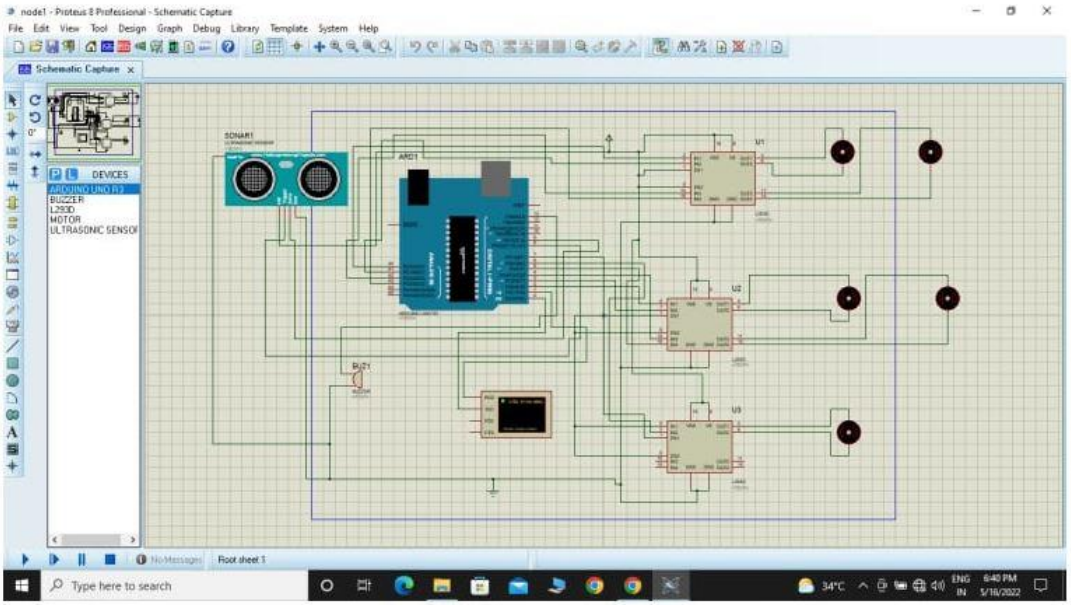


Figure 2: Schematic layout of cleaning robot

Primary tools involved in the design of surveillance robot:-

- Chassis
- Motors
- Camera
- Cleaning mechanism

Robot Chassis are the parts of an automaton that includes roll cages, bumpers, and other body components. This chassis plate is often used in conjunction with a customized design of robot platform. Locomotion is the movement of robot in response to impediments encountered.

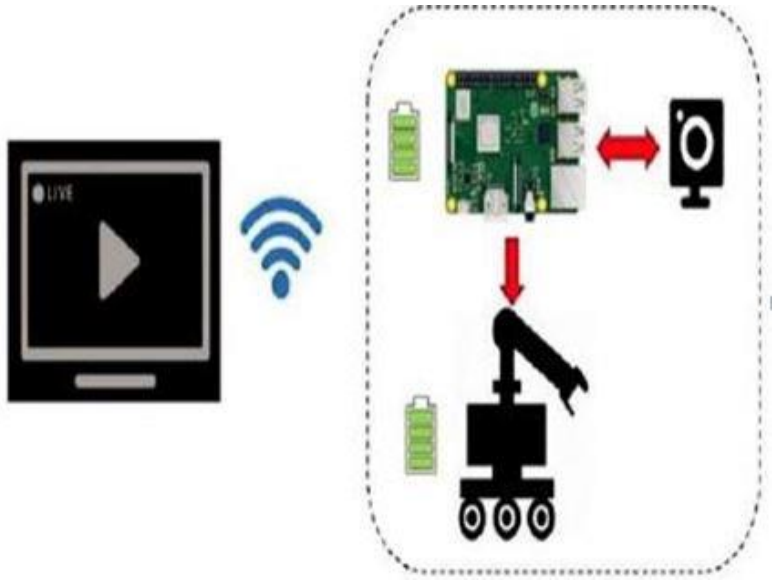


Figure 3: Assembly of surveillance robot

5.1 Block diagram and working principle

Level sensor will detect the level of fluid and simultaneously makes a note on the web server whereas the lid sensor will detect the position of lid and blockage in drain if present. This information signals are then forwarded to Arduino. Upon receiving the signals from sensors, the Arduino will start processing and operates the motor as required.

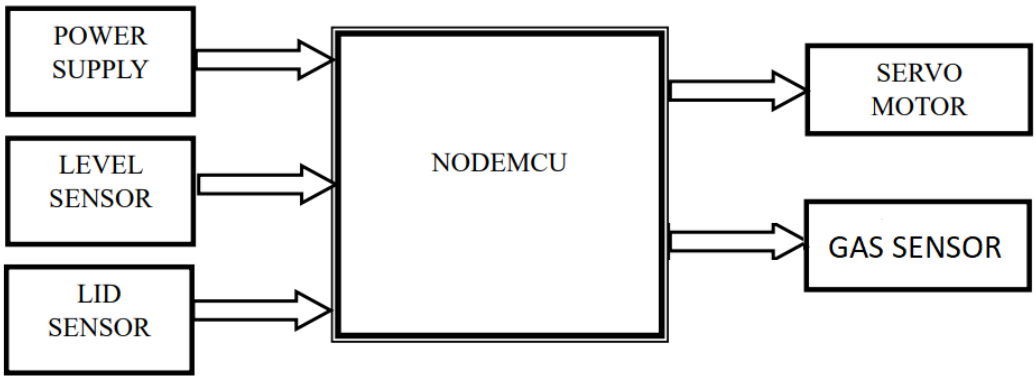


Figure 4: Block diagram for drain monitoring

Cleaning gears consists of a DC gear motor which rotates in different directions. L293d motor driver controls the directions of motor. Camera is interfaced for live video coverage and analysis of the working of robot.

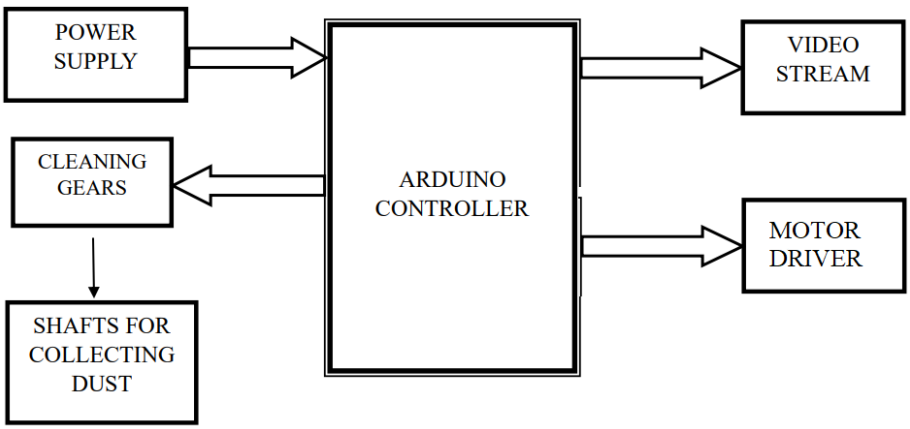


Figure 5: Block diagram for cleaning robot

5.2 Hardware and software tools

5.2.1 Hardware tools

- Arduino board
- Camera
- 5volts power supply
- Network module
- IR sensor for lid detection
- Ultrasonic sensor for level
- DC motors
- L293D motor driver
- Servo motor
- Gears and shafts

5.2.1.1 Arduino controller

Arduino UNO is a microcontroller board with fourteen digital data lines, six of which are used for analog input and other 6 pins for output. There is also a resonator made of ceramic, a USB port, power jack and a reset button.

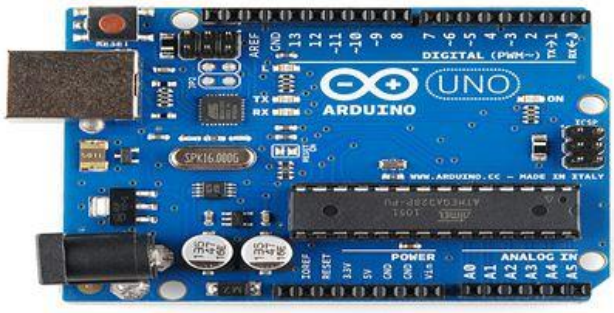


Figure 6: Arduino board

5.2.1.2 Node MCU

Figure 7: Node MCU

Node MCU is a combination of node and micro-controller unit. It lets the devices to connect and transfers the data using Wi-Fi protocols. The device alone can address many of the project's requirements.

5.2.1.3 Ultrasonic sensor

Figure 8: Ultrasonic sensor

An ultrasonic sensor measures the range of an item by using high-frequency radio signals. It is made up of a transducer, which exchanges audio signals. Most commonly used in the consumer products industry to measure the amount of liquid in containers.

5.2.1.4 L293D motor driver

Figure 9: L293D motor driver

L293D is a motor driver IC consisting of 16 pins. It's primary use is to power up the motors. A single IC may drive two DC motors at the same time, with each motor's direction regulated separately.

5.2.2 Software tools

- Linux fedora operating system
- Python
- C++
- Arduino compiler
- Adafruit server
- Proteus simulator

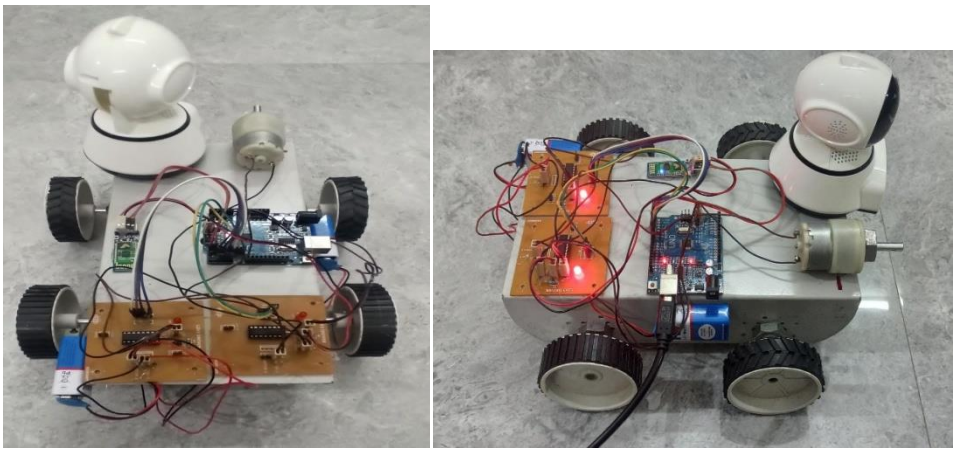
VI. RESULTS

6.1 Initial Results

Fedora OS installations steps are completed Arduino and NodeMCU is tested with supply voltage. DC motors are tested with motor driver IC L293d. NodeMCU data is observed at the Adafruit server.

6.2 Expected results

The servo motor will control the lid of the drain whenever it is required. The fluid level, gas detection and all other data are updated on the server online. The camera broadcasts live video on the mobile with the help of V380 application.



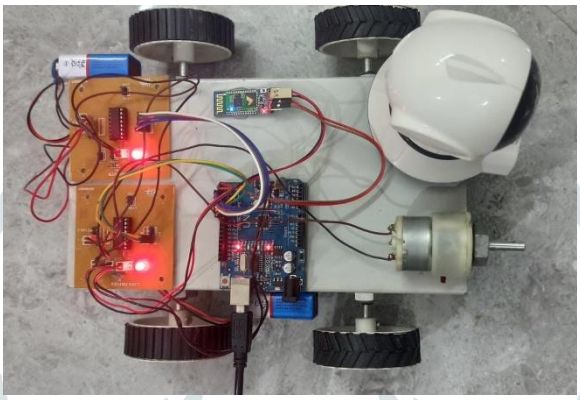


Figure 10: Experimental setup for Mobile Robot

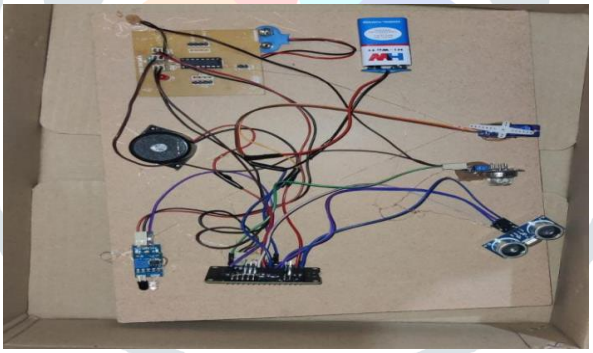


Figure 11: Experimental setup for Node 1

Results of node 1 for different sensors on Adafruit server are depicted in the figures below.

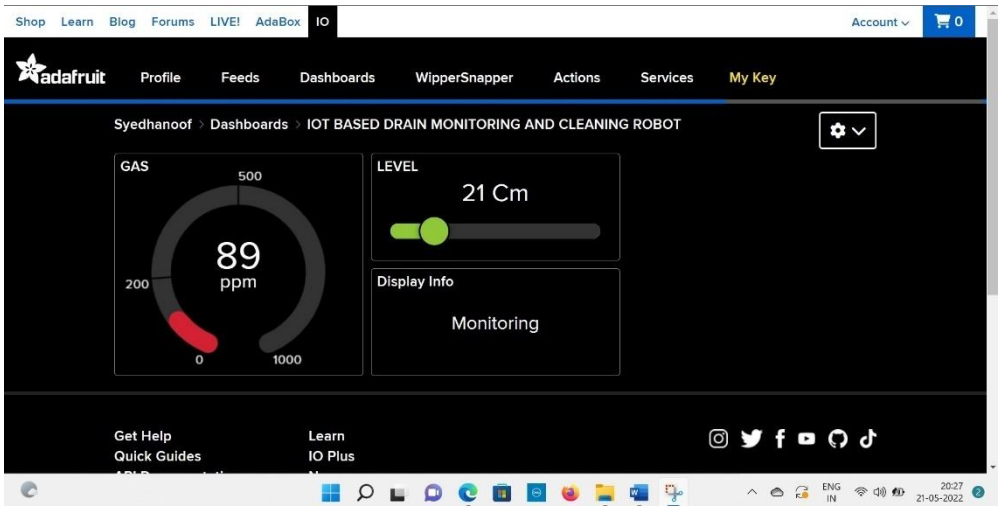


Figure 12: Data at power on condition

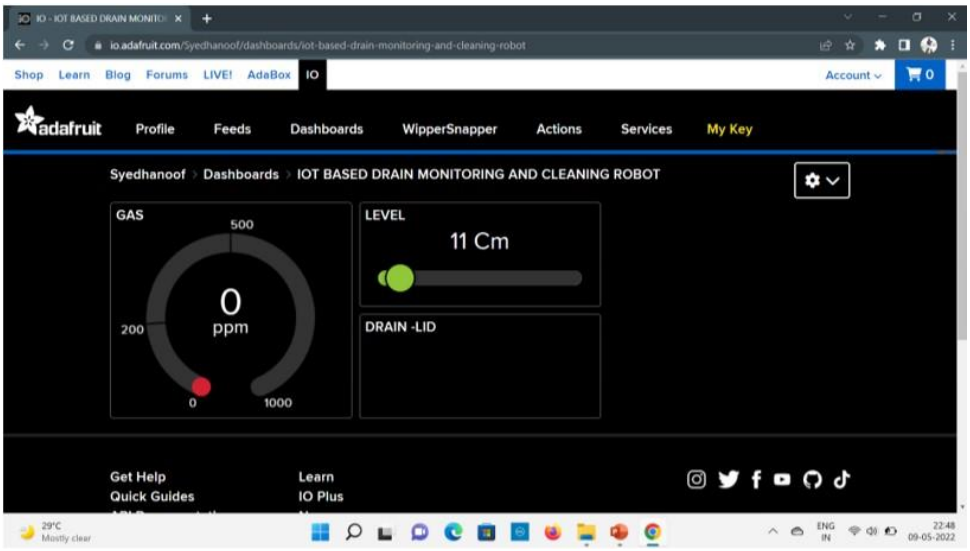


Figure 13: Data at power off condition

Figure 14: Actions performed by mobile robot

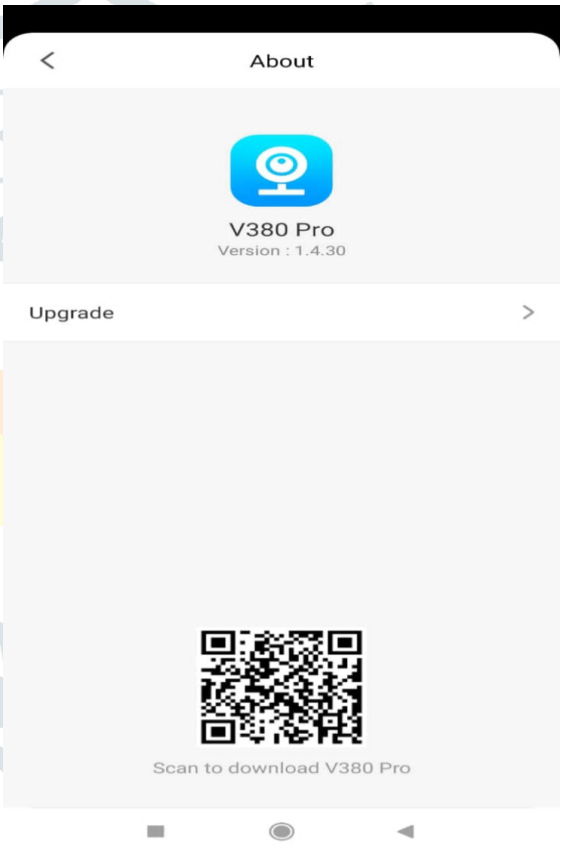


Figure 15: Camera app for video broadcasting

VII. ADVANTAGES AND DISADVANTAGES

7.1 Advantages

- This avoids costly precautions which are used to safeguard humans.
- It can avoid accidents (such as children and vehicle issues)
- It is portable and compact which reduces man power.
- Easy maintenance and simple in construction.
- Eliminating human health risk.

7.2 Disadvantages

- Battery could be exhausted and cause effect on working.
- Sensors are sensitive to environmental conditions in such situation working will be affected.
- Rusting risk of the system.
- Container or the chassis need to be cleaned timely.
- Complex material selection and design.

VIII. CONCLUSION AND FUTURE SCOPE

As the latest innovation in the industry, our research will give businesses with much-needed ideas for implementing automation with societal gains. Hygiene is one of the most fundamental utilities necessary for a person's daily life and offering such technology and affordable tool that may transform the terrible sewage conditions of India's urban areas.

In future Robot can be connected with more sensors to improve accuracy.

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