

Automated Scavenging Bot: A Survey

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ABSTRACT

Manual scavenging is banned in India, but the work still involves thousands of people and many die cleaning sewers. Most of the time, people are not provided with the mandatory safety equipment, making them vulnerable to fatal accidents. A methodological study is conducted here on the significance of image processing and its computer vision applications. The input given is an image during an image processing operation and its output is an enhanced image of high quality according to the techniques used. Image processing is generally referred to as digital image processing, although visual or mechanical images can also be handled. Our dissertation provides a solid introduction to image processing along with segmentation approaches, theories of computer vision and their relevant applications which will be of interest to the fields of image processing and computer vision engineering.

Keywords-Digital Image Processing, MATLAB, Robotics, Raspberry Pi, Scavenging.

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I. INTRODUCTION

There are some concerns that arise mostly in emerging or already established countries around the world. Sewer pipeline problem is one in which the primary sewerage line is mostly met with extreme blockage and leakage issues. Because of aging, traffic, geological change, sewer systems are prone to contaminate the water. The environment becomes rapidly polluted as a result of these losses. In addition, heavy rainfall events can result in system able to perform repair tasks of varying degrees of difficulty due to ongoing research and development of the mechanical design. Septic tanks are susceptible to damage due to aging, congestion, environmental shift, groundwater becomes progressively polluted due to these damages. Therefore, through monitoring is necessary to ensure an optimally working sewer system.

II. LITERATURE SURVEY BASED ON

1.1 Mobility:

drainage of filthy water onto our city's roads and streets and traffic congestion. In fact, if the same The power generator is primarily fitted with the phase problem occurs in the residences, all building motor, the DC servo engine, and the AC servo engine. occupants may suffer from a non-hygienic climate. For the moving carrier and the working mechanism, An extensive inspection is needed to ensure an the DC servo motor is used. The robot's kinetic carrier efficient sewer system.

One example is the tethered mobile robots used in municipal and industrial sewer networks for visual inspection. Tethered robots are is the structure of the mobile body, its main purpose being to perform mobile functions. It has the wheel framework, the structure of the crawler and the leg- foot structure and has many physical features such as rotation, acceleration, movement of distortion, etc.

The mobile wheeled system moves quickly and easily, but its touchdown area is too limited to sustain a degree of coherent affinity. It is easy to achieve a wide uniform link and is better adapted to unequal road surfaces, but its drawback is the heavy frame, hard to rotate, the complex structure and direction that must sustain the pressure. The tracks are more complicated. The track system has a large area. The tube under inspection, a remote camera is implemented. A high voltage battery powering the propeller runs a motor attached to the shaft. The wireless camera transmits high-quality images via its antenna to a receiver that is operated by a cable. The robot uses an IR proximity detector to detect an obstacle's presence [5]. footrest system has higher performance on the hard Stepper engines that give the vehicle the desired road surface and is heavier, but its control and movement control wheel movements. As shown in mechanical structure are complex and its speed is

Fig.1 the robotic vehicle moves, sufficient sluggish. The servo motor drives the box

shaft by information is collected to determine the parameters spinning through a roller chain, and the shaft of the motion and data is processed. The stepper operation. The movement of the cone-shaped helical system must transfer the front silt and other materials into its container when the robot meets an obstacle in order to ensure normal operation [12]. engine, in turn, is operated by the embedded system. The Ultrasonic Sensors are mounted on the robotic vehicle and operated through another stepper engine in its direction. The detector transmits the ultrasonic waves and receives reflections of changes in the This paper uses for navigation purposes the Kanal Untersuchungs Roboter Test (KURT) Platform. The KURT is sent into the LAOKOON-net, which is a dry sewer that is installed at the GMD site. The LAOKOON-net is built of concrete sewage pipe of inner diameter 600mm and has a total length of 80m. KURT uses only junctions as landmarks to navigate through the LAOKOON-net. These are basically four different types of concrete shafts: T, L, X, and exit. transmission media because of the material blocking and the deformation on the sewage lines [14].

There are sub-forms for the types T and L that correspond to the angle from which the junction is approached, e.g. "Left L" or "T from the middle leg." To navigate safely through the LAOKOON-net, it is necessary for KURT to identify the form of junction instead of individual ones [18][19].

1.1 Hardware Connection

A camera mounted on top of the robot performs live streaming of the pipeline's interior. The robot has a proximity detector at its body to identify an obstacle

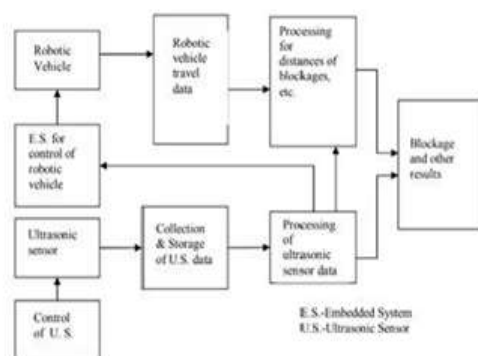


Fig.1 block diagram of desired embedded system

Our work is based on Matrix Vision's mvBlueLYNX 420CX Smart Camera. The Smart Camera contains a camera, an FPGA, a processor, and an interface for networking. More precisely, it

contains a single VGA in front of it. The rotor continues to cut through the obstacle as the robot reaches the obstacle and cleans it. Its body was designed using an internal 8-inch resolution CCD sensor and a Bayer color mosaic connected to it. For low-level storage, a Xilinx Spartan-IIIEFPGA (XC2S400E) is used. For the key PVC pipe. With 2 wheels mounted on each side of computations, a 200 MHz Motorola MPC 8241 the PVC pipe, the robot moves on the ground with 4 Power PC processor with Linux embedded MMU & wheels in total. With aluminum clamps, each wheel is connected to the body and appropriate screws hold it in place. To obtain images of the interior of the FPU running. It also contains 32 MB of SDRAM (64 Bit, 100 MHz), 32 MB of NOR-FLASH and 4 MB of NAND-FLASH. The Smart Camera communicates via an Ethernet connection of 100 MBit / s, which is used both to update and parameterize the network field and to relay tracking results during runtime. There are 16 I/Os available for direct connection to industrial controls. The Smart Camera's form factor (without lens) is 50x88x75 mm³. It consumes approximately 7W of energy. The camera is not only ideal for prototyping in laboratory conditions but also for the demands of harsh real-world production environments [17].

1.3 Control

No Autonomy: The system is controlled entirely remotely by a human operator, normally via a tether cable. The pipe state is assessed as the robot moves through the tube by the human operator who monitors the sensor data (usually video). Most of the commercial module is used for transmission and reception using the wireless transceiver. The Zigbee has a dynamic layout of the network. The Zigbee interface software was meant to be simpler and less costly. The night view camera is used to provide an unambiguous view of the tube [2].

The remote camera persistently transmits data to the controller and shows it in the device interface gadget. The ultrasound detector intermittently sends its quality to the operator. The controller interferes with the driver system and triggers the siphoning function. The siphoning system is worked up until the ultrasonic sensor yield estimates are returned to normal. For stubborn blockages, for example, wooden parts, thick sheets, etc., a swiveling tool is used. The pumping component can also be used to clear the rest sewer inspection robots are not autonomous systems. of the square. In the case that both siphoned Semi-Autonomy: The tethered robot (in some cases component and pivoting system cannot expel the untethered) is partially controlled by

automatic control plate, the display device is interfaced by the controller programs or modules, or the pipe condition assessment and helps to constantly check the client. The gas is partially carried out by sensor data interpretation programs. Fully Autonomy: The untethered robot brings on board all the necessary resources. Navigation is carried out completely by on-board computer hardware operating control programs. Status messages can be sensor is only turned on in unusual cases [3].

UGV's SLAM technological base often begins at a fixed station and finishes in the coordinates assigned to its origin. Pi NOIR cameras, L293D H bridge IC, DC Servo motor, Ultrasonic sensor, Raspberry Pi communicated through a wireless link to a human Controller are used. The use of an HC SR 04 inspector. The assessment of the tube state is mainly possible on board or offline following the collection of ultrasonic sensor is one of the best ways to feel the presence of objects. UGV also takes a specific sensory information [16]. procedure which is Planning following Obstacles Avoidance & Mapping, Path Initially, the user's Communication

The transmitters sector operates with the operator who transmits data via the camera and sends the feed to all mobile devices such as mobiles, laptops, etc. through the Wi-Fi network. The receiver segment consists coordinates are entered using a keypad and UGV is released in an open field. The camera Pi NOIR, attached to our Raspberry Pi controller will now be enabled. Once full subprocesses are performed, the execution should enter the engines that in this case are end drivers at the desired location. The MATLAB only of mobile devices connected to the Wi-Fi library, known as MAT-Pi, is communicated to network which provides data information in the Raspberry pi and runs via an intelligent Android wastewater and cleans the sewage from the outside surface [1].

The bot is sent into the sewer pipeline. The presence phone on the UGV side to link up images for track planning. Another very simple way to turn it right to 90 degrees if your robot detects an obstacle, and then push a given distance of one meter to determine the of any block on being visualized is cleared using optimum path again. When you return to drive to the water pressure and on the occurrence of any block, it will pick and place the same near the system. Zigbee goal, you will travel along the optimal route if you do not encounter any obstacle [4].

The UART serial communication protocol is used to communicate between the HC-05 Bluetooth module and ATmega32 microcontrollers. ATmega32 microcontroller sends the string first to the HC-05 Bluetooth module. The HC-05

Bluetooth module transmits the strings received via Bluetooth to the Android phone, and the Android mobile displays the strings in the Bluetooth terminal window. The microcontroller sends the return car and character of a new line to the HC-05 Bluetooth sending the series [7]. Module after

1.2 Image Processing

This paper provides a single board computer that computes the Motion Detection Algorithm written in python as a programming environment to design and implement the technology called live video streaming using Raspberry Pi. The Motion Detection algorithm



Fig.2 system framework

The method used in this paper for coding is MATLAB. The low-light video is added to the pre-processing first stage. The noise reduction is given the output from the first phase. For particular, contrast changes were introduced with a tonal change works on the principle of frame distinction, to compare the pixel value change from frame to frame and also to adjust the image element. This depends as a contrast time. A contrast expansion improves brightness variations evenly across an image's dynamic range, while tonal changes boost shadows on the algorithm if the movement is detected then one frame will be input frame for face detection. It converts the image to grayscale enhancing the image contrast. If internet access is via ADSL line and router setup with the IP address of Raspberry Pi, live streaming in remote locations and installing a motion technology and image capture system. Raspberry Pi device is used in this architecture camera module and connection between devices for accessing video streaming. The camera module is attached to the Raspberry pi board and used for high-definition video and still photographs. The Raspberry configuration with a python script that delivers the video stream to the cloud server automatically. The user can see the video directly on the web browser or any android device. The overall system framework is shown in Fig.2 [6].(dark), middle

tones (gray) and highlights (bright) areas, at the expense of brightness differences from each other. We need to apply filtering to eliminate the residual noise for the final step of low light video enhancement. Since the noise level is much higher than the low light environment, during the denoising process, edges and textures are often over-smoothed [8].

The system first extracts ring ROI (Region of Interest) images. The panoramic image from the extracted ring ROI image is created by converting the luminosity of each pixel at (x, y) into that at (r, θ) in the panoramic image. The relation between them is:

$$x = r \cos \theta, y = r \sin \theta$$

Because of the variation of brightness in a faulty area in sewer pipes, edge enhancement in the following steps is applied to the panoramic image.

(1) Convert the RGB into the brightness (Y).

$$Y = 0.3 \times R + 0.6 \times G + 0.1 \times B$$

(2) Use a Gaussian filter

(3) Detect edges. [15]

$$G + 0.1 \times B$$

To reduce noise.

II. TABLE

Author	Year	Technology/ Technique	Advantages
V.Ishwarya, B.Lavanya, J.Jesilla, Dr.G.Kavya	2019	Image Processing, Grinding, Suction.	Improves edge recognition, reliable measurement is consistently achieved.
Harichandan A V	2018	PIC Microcontroller Pick	The consistency at which a bot is able to complete assembly, quality control

Aruna.R, Bhavishya., Venkatesh.S, Ms. D.Jessintha	2018	Ultrasonic Sensor	High frequency, high sensitivity, and
Naveed Ur Rehman, Kundan Kumar, Ghulame Mustafa Abro	2018	Unmanned Ground Vehicle UGV, Simultaneous Localization, Mapping.	Solves problem association between data from the sensor the already integrated.
Mr.Abhishek Singh, Mr. Ankit B Parasha,	2017	Atmega Microcontroller, UART Serial	1KB EEPROM, 2KB SRAM, Program mabl

Mr.PiyushDe wangan,Mrs. K.Uma		Communication.	e USART.
Dr.G.G Sivasankari, Prerana Joshi	2017	Raspberry Pi for ImageProcessing.	Reduces complexity of systems in real-time.
Ms.Pallavi H. Yawalkar,Mr.P. N. Pusdekar	2015	Image Processing usesMATLAB.	Enhance video froman extremely low lightenviroment.

YUAN Fucai,WANG Lizhu	2010	ATmega16 microcontroller and communicate data through RS485 buses.	The Robot seal has little friction, the good wear resistance, and the sealing effect.
Dr.S.P.Sing, Dr.Ashish Verma, Ajay K.Shrivastava	2008	Robotics, Embedded System.	The use of Ultrasound waves overcome the problem of CCD Cameras.
Alireza Ahrary, Yoshinori Kawamura, Masumi Ishikawa	2007	Image Processing	Sobel Prewitt Gradient operators, and Laplacian operator used

Amir A.F. Nassiraei, Yoshinori Kawamura, Alireza Ahrary, Yoshikazu Mikuriya	2007	Electronic board, Optical underground wireless communication board.	The optical wireless system's wavelength ranges from 1330 nm to 1550nm, Data transfer rate of up to 10 Gbps.
Sven Fleck And Wolfgang Straßer	2005	mvBlueLYN X420CX, CCD Sensor, Xilinx Spartan-III FPGA	No additional computing outside the camera, Adaptive Particle Filter's Benefits.

III. CONCLUSION

The idea of automated scavenging robot, which will reduce manual scavenging in the country, leads to reduction of the health issues of people and will decrease overall environmental degradation, is being implemented in our literary review.

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