Implementation of the Integrated Monitoring System Based on an Automatic Disaster Prevention Device

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Abstract. In this paper, we have presented the Integrated Monitoring System based on an automatic disaster prevention device. The Integrated monitoring system aims to collect information related to vehicles' input and output and more. To design and implement the automatic disaster prevention system, production devices for antiseptic water and mining systems- vehicles and their license plate recognition systems- were designed and implemented. As experiment results, we can prove a disinfective function that is related to antiseptic water production device. We also proved that it is possible to monitor disinfected vehicles, moving vehicles and even the drivers at all times. Due to its characteristic of integration management, it can be adapted to remote farming and efficient monitoring in disinfection management.

Keywords: automatic, disaster prevention system, monitoring system, mining

1 Introduction

Advanced information communication and computer science have changed society in many fields. Especially, the advance in convergence IT technology consistently affected many fields such as the military, geology, agriculture, health service, and more. Developing and advancing these technologies is the trend now. Many researchers have been pointing out interest in these subjects and solving these problems.[1][2]

Specifically, in the case of agriculture in many areas, according to the adopted convergence of IT technology, technology's advancement, and practical use have been persisting to achieve enhancement and competitiveness of the agriculture field. After joining the FTA, the government is supporting domestic agriculture to become competitive against agro and livestock products which is imported from developed countries. As an example of practical use of convergence IT, sensor networks is used for various goals in many fields such as agriculture, livestock, and the fishing industry.[1]

Also, in case of domestic and international, huge nations try to prevent biological disaster. Because S.A.S which occurred in agro and livestock industry frequently heavily damaged people who work in these fields and even gave irrecoverable damage which cannot be sustained individually or nationally.

In this paper, in order to overcome these difficulties, we designed and implemented an automatic disaster prevention system and integrated a monitoring system to overcome disasters in the agro and livestock industries. Related to automatic disaster prevent system such as references [3][4], many researchers are engaged in these fields. It is the same for antiseptic water. Also researching with a mining system is conducted actively, especially in traffic. The automatic disinfection system is made up of antiseptic water production devices. And the integrated monitoring system consists of mining and vehicle recognition systems.

2. Integrated Mining System

As shown in figure 1, this displays the proposed architecture system for the Integrated Mining System in this paper.

As shown in figure 1, this system consists of an antiseptic water production device as a disaster prevention device and a mining system that consists of a camera, a communication unit, a vehicle recognition system, and a license plate recognition system. Information which is received from these devices is accumulated to a central integrated monitoring system based on a cloud system.

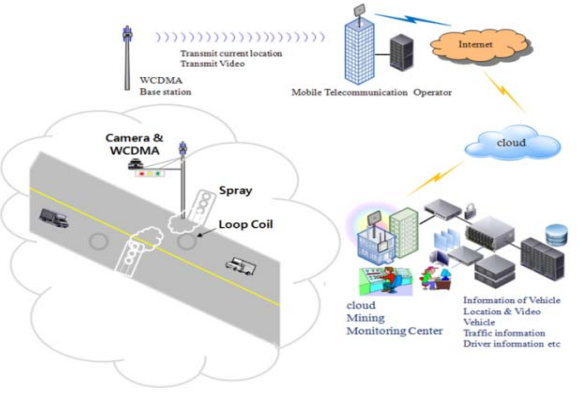

Fig. 1. System Architecture

2.1 Automatic Disaster Prevention System

An automatic disaster prevention system is shown in figure 3. Basically the architecture system consists of an antiseptic water production device, camera, communication, spray, and control unit.

As shown in the following figure, information of a vechiles' license plate which is taken from a camera using signals from a sensing device, and the original vehicles' image is transmitted to the integrated system by Internet or communication unit. Also the spray's function depends on an event signal which is detected from sensors (deployed loop coil).

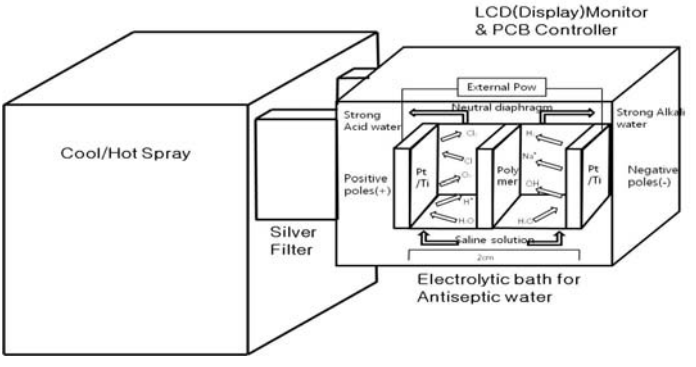

Fig. 2. Production system for antiseptic water

In figure 4, the vehicles' disinfection devices are divided into the storage, spray, connection, and antiseptic water production unit.

Storage part can store water and is able to have a pumping device. The pump will pump water stored in the storage part.

The spray part has water sprayed to vehicles. It is formed at a certain length which stands at each side with a certain distance. It could be assigned to stand on the edge of the road. It includes a pipe and some nozzle.

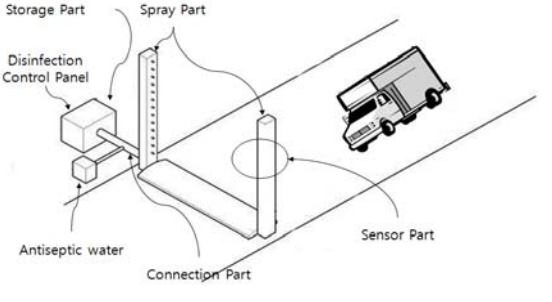

Fig. 3. Automatic Vehicles Disinfection System

The pipe can stand on the ground perpendicularly. The nozzle can be formed in a certain order depending on the direction and length of the pipe.

In the connection part, the storage and spray parts are connected. In this part, there would be an installed pump which pumps storage water.

2.2 Vehicles Recognition system & Integrated Monitoring System

The Integrated monitoring system is designed to get a moving vehicles' video image and its license plate information. Figure 4 is a brief algorithm for vehicle recognition.

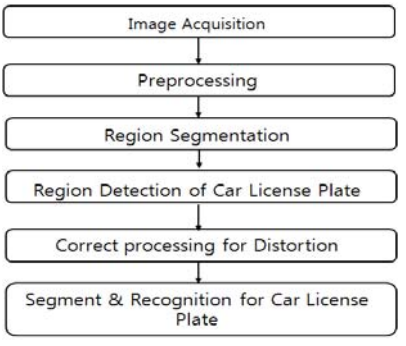

Fig. 4. Algorithm for Vehicles Recognition

In the process of image acquisition, the specification of the camera is an effective pixel(1628Hx1236V), pixel size(1624x1232), and real frame rate(16, 1624x1232, Mono 8) in our system.

Preprocessing, is a process to enhance video image by using the surrounded pixel's relation such as filtering, binary coding, color segmentation. However, in our system, we used the Top – Hat method.[7][8]

Regional detection, is a process to get the region of a car license plate. This process is progressed by Sobel, Gray scale vector, information about hue, brightness, and saturation of vehicles, histogram, and the Run–length method. And many researches are processing study.[7]

Distorting and correcting process, after preprocessing and region detecting, overlapping and blurring can occur at the edges in correcting character region which can cause distortion. To solve this problem, we process distortion correction by the morphology processing method.[9]

In region segmentation and recognition process for character, we divide the plate region into upward and downward regions by horizontal profiling. Each region detaches a character region by perpendicular filing. Next, we split those regions. Finally, we implement an algorithm of character recognition and adapt it to the split character region.

There are many algorithms such as neural networks, structure information, statistical information, circular pattern, and recognition specific base. But in our system, we choose the method based on neural networks.(Figure 5)

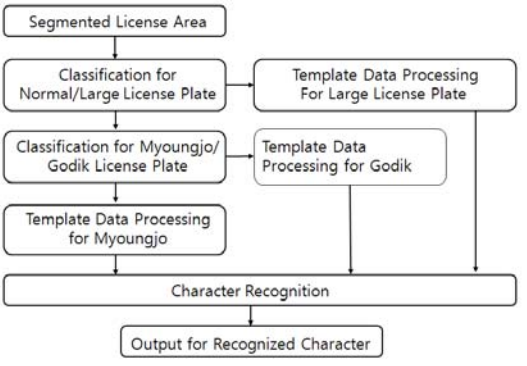

Fig. 5. Flowchart of Character Recognition Algorithm

The Integrated monitoring system collects and manages various vehicles' related information. For example, there are vehicle images, plate information, visiting time, visitor information, and so on. These data are acquired by the vehicle recognition system. And the mining system is designed as component of the integrated monitoring system.

This Monitoring system consists of a real time monitoring part, object management, configuration management, user management, and a login/out part. Our system is designed to monitor at all times, the acquired objects which are monitored real time vehicles. Their information – the object's list, images, and map images are also acquired.

Object management is designed for the object's registration and deletion. Also it manages various information which are related to the objects.

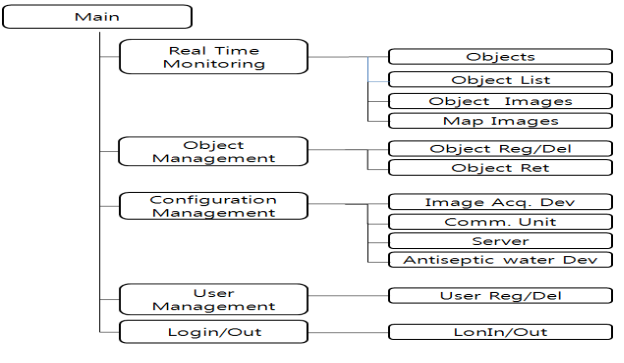

Fig. 6. Integrated Monitoring System Architecture

The components of the configuration management part, are camera, communication unit, server system, and an antiseptic water production device. It is designed to manage information which is related to the system's components.

The user management part, is designed to register and delete users.

Log management, is designed to manage and record the integrated monitoring system's log-in/out.

3. Conclusion

In this paper, we presented an automatic disinfection system and their data monitoring system. This system could contribute to achieve high quality agriculture and overcome biological disasters.

This integrated monitoring system is based on a cloud system to get efficiency and convenience in implementation of the system. By its characters, the system could be installed remotely. And data which collects through remote devices can be accumulated to the central devices effectively.

Using this system in the agro and livestock industry, we can determine the competitiveness of our product's quality and efficiency of management in disasters is assured.

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