Conceptual Design of Smart Phone-based Public Reporting System for Unordinary Events Occuring in Streams

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***Abstract*— The rapid advancement of smartphone-based technologies in South Korea has introduced new opportunities to administrators responsible for stream water quality monitoring programs. The sensing functionalities of a smartphone can be used as a handheld monitoring and reporting system using the people-centric sensing approach. Unordinary events occuring in stream can be captured and reported by the public using their handheld devices. The instant contextual feedback capability of the smartphone-based system in the form of geolocation, time, user's description and image data will be very useful to the public, authorities and the research communities in the area of water quality management. This paper proposes a conceptual design of smartphone-based public reporting system to inform in ad-hoc of unordinary event occurring in a stream.**

***Index Terms*—public reporting, stream monitoring, water quality.**

I. Introduction

A study by [1] shows that Korean people are easily adopting new technology, meaning that it is feasible to implement a participatory sensing system in Korea. According to [2] , the participatory sensing system is mainly emphasize the human participation in the sensing process which is called a people-centric sensing approach. There are literatures [3 - 4] highlighted the importance of public engagement and involvement in environment monitoring.

II. Smartphone Sensors

Recently literature [5] reviewed the use of smartphone data as a digital evidence. These studies focused more on using smartphones for digital forensic. Sensing functionalities of a smartphone also can be used to report unordinary events in stream by the public. It has been shown that smartphone can be used as a handheld measurement system [6]. Table I shows the smartphone sensors required in the proposed design.

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TABLE I
SENSING FUNCTIONALITIES OF A SMARTPHONE

Sensors	Functions
Optical (Phone Camera)	Scan QR-code and capture images.
Time system	Record timestamp.
Geolocation	Record global position coordinates.
Wifi/GPRS/3G/4G	Transmit obtained data to central server.

III. Proposed System Design

A. Process Design

The basic design of the proposed system (Figure 1) can be explained with the following process flow.

Step 1 : A signage is installed near the stream in a form of banner printed with a QR code containing a specific web address and location ID.

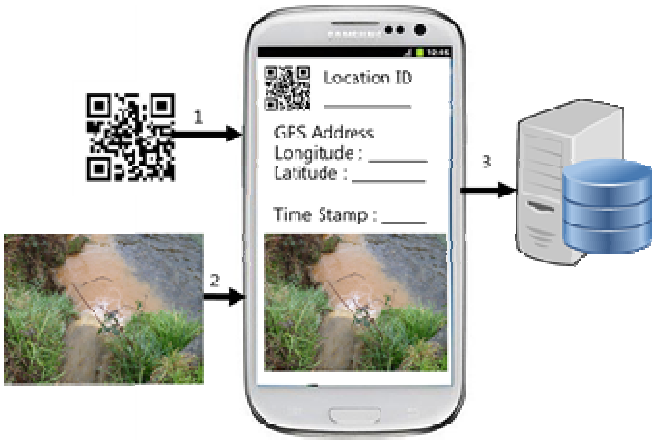

Fig. 1. Smartphone-based Reporting System.

Step 2 : The QR code can be scanned with any typical QR code application which utilizes the camera in the smartphone. The application can be downloaded for free from an

application store.

Step 3 : The QR scanner redirects to activate a form that captures the current geolocation and timestamp from the smartphone.

Step 4 : Image of an unordinary event occuring in stream (refer Table 3) can be captured and classified later.

Step 5 : All the information (user ID, location ID, geolocation, device timestamp and image) are uploaded to the web server.

B. Data Design

The primary data required in this conceptual design are shown in Table II.

TABLE II
PRIMARY DATA DESIGN

Data	Source
Location	QR-Code or geolocation sensors
Images	Phone camera
Time	Phone clock, server clock.
Events classification	User (person)

IV. UNORDINARY EVENTS IN STREAM

Table III shows a list of potential water pollution events might occur in a stream.

TABLE III
PRIMARY DATA DESIGN

Event Classifications	Related Works
Oil spil	[7]
Plastic waste	[8] & [9]
Food waste	[10] & [11]
Dead fishes	[12]
High turbidity	[13]
Overflow / Flood	[14]
Drought	[15]
Algae	[12] & [16]
Odor	[17] & [18]

V. EXPECTED OUTCOMES

With the instant contextual capability of the system through obtained data (geolocation, time, event type and photo), the system could provide additional information to the government authority or municipalities regarding environmental status. The system is expected could provide computational data for research communities in related area of study such as computing, environmental, economy and social science.

VI. EXPECTED CHALLENGES AND ISSUES

Since our proposed design is based on user generated content over Internet, we are expecting issues like copyright, security and privacy which guarantees for further study.

VII. CONCLUSION

Public reporting of the pollution events occuring in stream is important for the municipal authorities. In this paper, an innovative smartphone-based public reporting system has been proposed to improve the current stream monitoring program to the higher level. The instant contextual feedback of the system not only useful to the public and authorities, but also to research communities. Future research is required in order to measure the effectiveness of the proposed system.

ACKNOWLEDGMENT

This work was supported by the R&D program of MOTIE/KEIT (10037331, Development of Core Water Treatment Technologies based on Intelligent BT-NT-IT Fusion Platform). We also thanks to Ministry of Education Malaysia and Universiti Malaysia Pahang for Mr Abdullah's PhD study scholarship at University of Seoul (KPT (BS) 780612035619).

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