Context Assisted Automatic Fuel Price Collection in Mobile Phone based Participatory Sensor Networks

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I. Abstract

Price differences exist in people's daily life. The availability of real-time price information through mobile phone offers consumer benefits, which provide incentive for user contributions. For such schemes to be adopted, the cost of contribution must be more than offset by the benefit of the information. However, even in this high tech society, we have to accept the fact that such price information is still collected manually. Fuel price, as a piece of increasingly important information to our daily life, is no exception. In this poster, we will introduce our *PetrolWatch* system [1], [2], which collects fuel price automatically by using the ubiquitous mobile phone as the sensor nodes. Based on our best knowledge, *PetrolWatch* is the first instance of Participatory Wireless Sensor Networks (PWSN) [3] for commercial information sensing.

Our system has two modes of operation: (i) fuel price collection and (ii) user query. The process of collecting the fuel prices is completely automated. This is achieved by automatically triggering the mobile phones of contributing users to take pictures of roadside fuel price boards when they approach service stations while driving. Our system employs sophisticated computer vision algorithms to scan these images and retrieve the fuel prices. To reduce the complexity of the computer vision tasks, our system relies on contextual information that is made available by GPS and GIS software such as the service station location coordinates, brand information and time of capture. Our PWSN based system requires participations of mobile phone users in ensuring proper positing their mobile phone in the dashboard and orientating it to roadside.

Figure 1 presents a pictorial overview of our system. As depicted in the picture, the data collection process involves three steps: (i) capturing images of the fuel price boards, (ii) extracting fuel prices from the images and (iii) uploading the classified fuel prices to a central server. Each of these tasks is executed by a distinct component of the system.

Context plays crucial role in the whole data collection procedure as mentioned above. The detailed introduction about each system component and the image processing algorithm can be found in [1]. In this poster, we will concentrate on the context effect to the data collection of this system. Through such research, we seek to answer such questions: (1) what is the best distance to trigger the camera. (2) How the light condition affect the fuel price recognition etc.

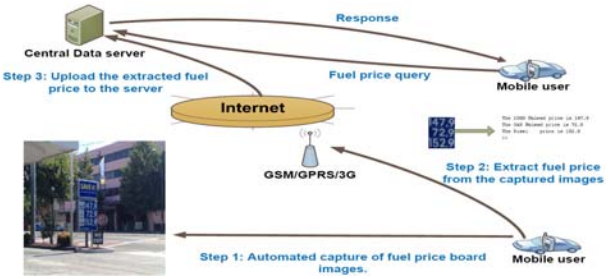

Fig. 1. System Architecture

We implemented and tested a fully functional prototype based on a Nokia N95 mobile phone. If the car is within an acceptable distance for taking pictures, the camera is automatically triggered to take up to 5 pictures at 1.2 s interval. The camera is switched off once the car has passed the service station.

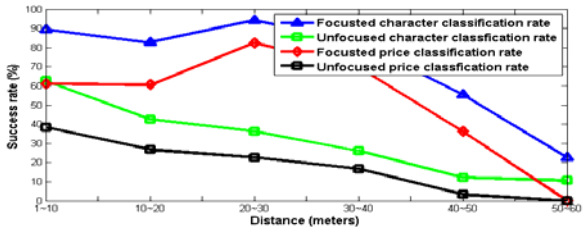

Fig 2. Distance effect

Due to the space limitation, we only demonstrate some important experiment results. The fuel price classification rate vs. various distances is shown in figure.2. From this we conclude that the proper triggering distance is within 30 meters. Based on 77 images, our system achieves a hit rate of 80.96% for correctly detecting the fuel price board from the image background and reads the prices correctly in 80.56% of them, when the camera is within the proper distance.

References

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