

PlaceMemo: Using GPS and Mobile Computers to Augment the Roads

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ABSTRACT

This paper introduces the *PlaceMemo* prototype, a system developed to support road inspectors in their daily work. The concept is based on an ethnographic study conducted at the Swedish National Road Administration-Production during 2000. *PlaceMemo* supports the articulation work, allowing road inspectors to save, and share, interpretations of objects in their geographically widespread working area. Once an interpretation has been accomplished, the inspectors will have the possibility to retrieve the information when being in the vicinity of the tagged object. The system is supposed to complement the existing formal reporting tool (*ProData*), which mainly facilitates the administrative work.

Keywords

Augmented reality, mobile devices, articulation, prototype

1. INTRODUCTION

There is a growing interest in the development of mobile information systems, for example systems handling reminders or tools to augment the physical world. Some good illustrations are *CybreMinder* [1], *ComMotion* [3] or *GeoNotes* [4]. These systems do all vary in functionality and complexity, but in common they share the possibilities for users to create, and retrieve, digital information connected to physical places. The two solutions supporting reminders [1, 3] are supposed to be as general as possible, adapting to all situations. The authors claim the importance of contextual factors when developing this kind of systems, but still they do not introduce studies of the user setting. In this case we prefer the approach of targeting the systems to a specific user group, based on findings from empirical studies. The use of ethnography to inform the design has proved to be successful in the CSCW-community.

During our fieldwork at the SNRA-P (Swedish National Road Administration-Production) we were confronted with a sample of breakdowns, where today's work practice seemed to be

insufficient when managing occurring problems. The prototype is based on these findings, and the system is supposed to complement the existing formal reporting tool (*ProData*). The main purpose with the formal system is to keep track of all identified defects, to conduct a proper apportionment of costs. The observations of inspectors taking notes, using mobile phones and attempts on memorizing information is the base for the *PlaceMemo* idea. The prototype will rather support informal activities of sharing interpretations of possible defects, and it will also act as a tool handling reminders. The initial prototype will focus on the actions of saving and accessing earlier interpretations. Our collaboration with SNRA-P will make it possible to loosely integrate the systems, facilitating functionality to import data into *ProData*.

2. THE SETTING

The inspectors conduct a truly mobile work, since they are constantly on the move. It is not a fact of movement between different work places, seeing that the continuous movement could be understood as the work itself. The simultaneous tasks to perform give rise to a complex environment to support with information technology.

2.1 The road inspectors

The road inspectors spend most of their time alone inside a truck, driving at least 150 kilometers each day [2]. To keep track of their tours of inspections, and all defects identified along the roads, they use a system with mobile computers connected to a GPS-receiver (*ProData*).

The inspectors' work could be divided into the three categories of identifying, reporting and repairing. The first phase consists of observing and identifying all possible defects on the roads and in the vicinity. This is done while driving the vehicle. Examples of defects could be "potholes" in the roadway, or illegal signs by the roadside. The second phase consists of repairing the identified defects. Each of the defects has to be reported into the system, which is the third phase. This reporting has to be done even if the defect is left without immediate measures. The system logs the tour and the inspector feed defect-codes into the system, he can also use the keyboard, typing his own text describing the defects. There are approximately 50 predefined codes available, and *ProData* will automatically generate time and location.

There are a number of situations when the system acts insufficiently in supporting the inspectors [2]. The complexity of applying the formal rules gives rise to a need for saving interpretations to later moments. The sharing of information is lacking since the procedures are weak, and there are sample of

practical problems when feeding the system with data. To work around these problems they are using paper notes, mobile phone calls, or memorizing the information. Their methods of augmenting the roads today are very individual and work insufficiently in holding the information during an sufficient period of time.

2.2 Technical prerequisites

During the fieldwork, the cars were equipped with handheld computers (Psion Workabout) and GPS-receivers. Recently the trucks have been updated with higher performance computers, running on Windows 9x/NT.

3. PLACEMEMO

To solve the problems observed during fieldwork [2], the *PlaceMemo* prototype is developed with the idea of creating a blunt IT-artifact. The solution is non-complex, but well adapted to the specific contingencies of the inspectors' situation. They will have the possibility, and responsibility, to supply the system with relevant information. Their efforts will be awarded with a working environment augmented with information supporting the performance of their working tasks. The system will handle reminders and earlier accomplished interpretations. The prototype is designed for mobile use, and will support collaborative activities. It works in parallel with the existing reporting system and uses the GPS-receiver to position the information given by the inspectors.

To give an overview of the functionality we introduce three simplified categories of usage.

3.1 Input while mobile

The need to stop the vehicle in order to either communicate or report is essential for the reporting of the defects today. Thus, designing a system that makes these activities easy to perform at the same time as being mobile could increase the number of reports and communication and thus strengthen the possibilities for articulation of the activities. The system allows the users to save a position while moving, and to record a voice-memo connected to that specific position. The interaction will be handled by a set of buttons assembled on the steering wheel, but we are also conducting tests with speech recognition.

3.2 Information on the move

The prototype will work as a reminder system that trigger reminders automatically by location. The voice-memos should be triggered in advance so that the driver can prepare a stop in time, which is especially important when the roads are crowded with vehicles. This triggering distance is predetermined to 100 meter, but can easily be changed by the inspector. To give an understanding about the distance to the actual place for the reminder a countdown will be visualized on the screen. The system is configured to play a short signal to catch the drivers' attention and not to play the complete message while entering the triggering area. The system is able to handle more than one reminder located within the triggering area, and they will be displayed in an "active reminder" list.

3.3 Stationary data

To fit with current practice, i.e. the articulation work, it is essential that the system should handle different forms of information, that is both situated and contingent ways of representing defects as well as the filing of data according to the formal organisational requirements. Reporting will thereby be saved to a more appropriate occasion than driving on the motorway. The inspector could e.g. listen through and code the messages during his breaks.

The prototype will work in parallel with the existing reporting system, and will have functionality to import data into *ProData*. The system supports the planning of individual work with an easy way to retrieve and edit the place-memos. An important feature of the system is the possibility to edit the reminders, i.e. to record new message associated to a taken co-ordinate or to add short text messages connected to a "to do list". It is therefore important to overview the information in the system, which could be troublesome when the memos increase in amount. The prototype organizes the place-memos in a tree hierarchy by date and time. Reminders can also be found by performing a search specifying responsible person or time etc.

4. DISCUSSION

The objective with the proposed system is to handle reminders and interpretations. The information stored in the system will be used to save, communicate, and deliver, interpretations of the local contingencies. The design implications suggest a redesign of the current system, integrating informal actions into the formal reporting tool. We focus on the support of manual work, integrating loosely coupled methods of recalling, delegating, and informing actual contingencies.

The first prototype will be evaluated in its original setting. Based on these experiences a second prototype, with a stronger focus on collaborative properties, will be developed, and evaluated.

5. ACKNOWLEDGMENTS

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6. REFERENCES

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