MoveON: A Multimodal Information Management Application for Police Motorcyclists

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Abstract. In this report, a series of findings, options and implementation decisions are reported regarding the development of the MoveON system, an application of multimodal and sensor-enabled minimal-distraction interfaces for enabling motorcycle Police officers to access online, in real-time and taking into account on the road safety issues, services and information resources.

1 INTRODUCTION

MoveON a European Commission funded project (contract IST–2005–034753) aims to complement existing communication technology by several modes of interaction between the user and the communication device, in order to be of assistance during Police operations in mixed situations on the move. The MoveON prototype system and application are also supporting the complimentary use of sensors, speech [1] and tactile modalities investigating the edge in the state-of-the-art for motorcycle set-ups.

2 THE SCENARIOS

Four typical scenarios (Figure 1), derived from the user requirements [2,3] to illustrate the dialogue interaction in operational practice of Police officers. These scenarios are:

1. **General Patrol – Traffic Enforcement – Arrest:** The goals relating to general patrol revolve around high visibility policing – a visible Uniform presence in the community to prevent crime, road safety – by being visible on the streets the public will not commit traffic offences and traffic law enforcement

2. **Injury Road Traffic Collision:** The goals relating to injury road traffic collisions (RTCs) revolve around scene management, scene investigation establishing the causes of the collision, evidence collection ensuring that all of the required evidence is collected to support all legal requirements (see above) and road safety, returning the scene to normal working conditions to minimize disruption

3. **ANPR Duty:** Automatic Number Plate Recognition (ANPR). This term refers to a tour of duty in which a number of motorcyclists, one or more traffic cars and a bespoke vehicle (ANPR vehicle having a camera to read the number plates of passing vehicles) establish themselves on a nominated road within an OCU to check the registration numbers of vehicles that pass the camera in the bespoke vehicle. The goals relating to ANPR duty revolve around high visibility policing – a visible Uniform presence in the community to prevent crime, road safety by being visible on the streets the public will not commit traffic offences, catching disqualified drivers, arresting persons involved in crime and traffic law enforcement

4. **Personal Attack Alarm:** A typical bank alarm where the bank teller believes that the premises is about to be robbed or there is a robbery in progress. The goals of personal attack alarms relate to scene management, providing safety and security of police and civilian personnel and property at the scene, and apprehension of offenders (if appropriate).

Figure 1. Police motorcycle evaluating MoveOn in Birmingham

3 ARCHITECTURE OF THE MOVEON SYSTEM

Two close-talking microphones, a throat microphone, headphone, a simple heads up display, a deceleration warning light, an image and video capture camera and a local processing unit will be embedded in the helmet. The helmet design is optimized for

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reducing the noise from environment and wind. The main processing unit, a GPS sensor, an accelerometer and inclinometer sensors, a touch-screen display and a tactile input device will be placed in and around a jacket that is to be worn by the motorcycle driver. Finally a TETRA radio device will also be placed in a jacket pocket, together with an adequate power supply and connection wires between all interconnected devices. These devices will serve the purpose of getting input from and providing feedback to the user (Figure 2) and for achieving context and situation awareness.

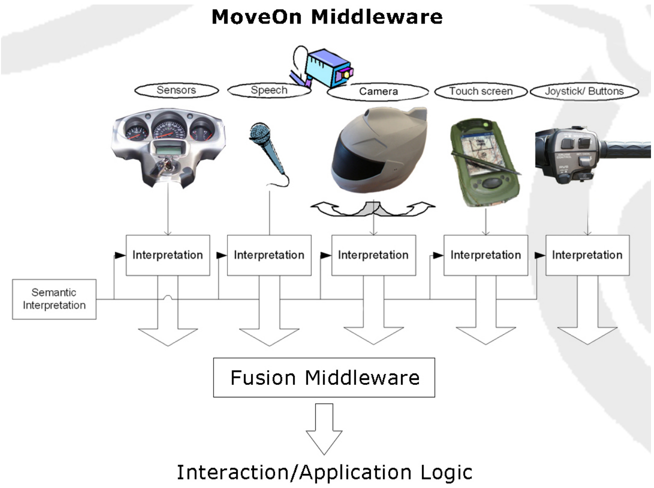

Figure 2. Fusion Interaction Logic

The first level of such mechanisms enables the activation or deactivation of several system functions by the user (e.g. deactivation of the TTS when the user thinks that it distracts him from the task he is currently performing). The scroller input device attached to the glove is electronically connected both to the system MPU and to the existing TETRA device carried by the user. Whenever the user wants, he may switch the role of the device, from this of navigational control exploited by the multimodal information management application to that of the push-to-talk button used in direct TETRA voice communication. The second level relates to the dynamic selection of the user interaction mode. Finally, the third level comprises of the error-resolution and correction mechanisms embedded into the interaction flow manager of the system, which is the component that controls the discourse of the user interaction with the system.

The architecture of the multimodal system is allowing for the system to be cross-modal in several occasions. Of course, not all modalities can have the same information bandwidth when used by the motorcyclist in order to input information to the system or by the system to output information to the motorcyclist. To this end, three different ways of interaction are offered: a spoken dialog interaction through specific command phrases; a hierarchical menu-driven feedback channel to be used by a tactile-based input interface; a combined cross-modal interaction that could switch anytime between those two modes without losing any context-specific high-level information. A multimodal interaction mode is currently designed by fusing all available inputs on a semantic level, after they have been parsed and interpreted. All offer the same commands to choose from. The feedback to the user is implemented through a screen display and a Text-To-Speech (TTS) system. MoveON decides on which to choose based on Finite State Machines (FSMs) that model the situation at hand.

The framework for implementing the multimodal interaction system is an adapted version of RavenClaw/Olympus [4]. In the process of the MoveON implementation, several components are adapted and new ones are complemented. For instance, Julius/Julian [5] speech recognizer is used instead of Sphinx, and new components that support the multimodal interaction (e.g. components for parsing the input from the tactile scroller and from the helmet camera (Figure 3) and the various sensors used in MoveON) are developed.

Figure 3. Helmet Camera

4 CONCLUSIONS

In this report the description of a new multimodal interaction application for Police motorcyclists is presented. The overall architecture of the MoveON system is presented, including application scenarios specifically designed for command & control end users.

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