

MIME- NLG Support for Complex and Unstable Pre-hospital Emergencies

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Abstract

We present the first prototype of a handover report generator developed for the MIME (Managing Information in Medical Emergencies) project. NLG applications in the medical domain have been varied but most are deployed in clinical situations. We develop a mobile device for pre-hospital care which receives streamed sensor data and user input, and converts these into a handover report for paramedics.

1 Introduction

Natural Language Generation underlies many applications in the medical domain but most are employed under relatively predictable clinical situations. The MIME project employs a mobile device with novel lightweight sensors to improve pre-hospital care service delivery. The term pre-hospital care denotes the treatment delivered to a patient before they arrive at hospital. Usually this entails paramedics and ambulance teams, but it can also include a wide range of voluntary and professional care groups. Care for rural pre-hospital patients can sometimes be carried out by volunteers from local communities: Community First Responders (CFR). Their task is to assess patients, perform potentially life-saving first aid procedures and record medical observations whilst the ambulance clinicians are en-route. These data are then handed over to the receiving ambulance team upon arrival. Because of their time-critical nature, handover reports are often verbal and hence may be incomplete or misunderstood.

MIME was inspired by the Babytalk BT-Nurse system (Hunter et al., 2012), which generates shift handover reports for nurses in a neonatal intensive care unit. While BT-Nurse works with an existing clinical record system, which does not always

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At 02:12, after RR remained fairly
constant around 30 bpm for 4 minutes,
high flow oxygen was applied, she took
her inhaler and RR decreased to 27
bpm. However, subsequently RR once
more remained fairly constant around
30 bpm for 8 minutes.
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At 02:15 she was feeling faint.
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At 02:15 the casualty was moved.
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At 02:17 the casualty was once more
moved.
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Figure 1: Part of the "Treatment and Findings" for an asthma scenario.

record all actions and observations which ideally would be included in a report, in MIME the electronic record and user interface for acquiring exactly the desired information are effectively designed. This simplifies the NLG task, at the cost of adding a new task (interface construction).

2 The MIME project

Pre-hospital care is especially challenging because the environment in which it is delivered is inherently unpredictable. The clinical condition of a patient may have improved or deteriorated since the original call for help. The unpredictability of the environment at the scene of the call and the minimal level of clinical training of the CFRs contributes to the challenges presented to developers of a mobile device for this situation. In particular, the continuous capture of physiological data introduces the problem that irrelevant material needs to be suppressed in order not to overload the ambulance clinicians and hinder interpretation. The generated reports must provide a quick overview of the situation but at the same time be comprehensive. It is also vital that the format must enhance the readability, and the user-interface be simple and intuitive in order to avoid what has



Figure 2: First hardware prototype of the MIME project (GETAC Z710 tablet and Pulse Oxymeter sensor).

been termed ‘creeping featurism’ (His and Potts, 2000), whereby option saturation hinders task performance.

In a user centred development process we established a structure for the handover reports. After the demographic description of the casualty (i.e. age and gender) and incident details that were relayed to the CFR by the ambulance control centre two elements of generated text follow, the initial assessment section and the treatment and findings section. The initial assessment contains information on the casualty that is gathered by the CFRs before the sensors are applied including baseline observation during the first minute after the application of the sensors. The treatment and findings section (Figure 1) is a report of the observations and actions of the CFRs while they attended the casualty and waited for the ambulance to arrive. This includes a paragraph that sums up the condition of the patient at the time of handover. There are three types of events included in the report: discrete events (action and observation) and continuous events (trends in sensor readings). Actions (e.g. applying oxygen) and observations (e.g. the patient feels faint) have to be entered by the CFR through an interface. Continuous events are derived from the medical sensors: currently respiratory rate, blood oxygen saturation, and heart rate are recorded. Since some events, especially those that deviate from the norm are more important than others (Hallett et al., 2006), in the document planning stage we employ an algorithm that decides which events are mentioned in the report

and in which order. This process is loosely based on similar decision processes reported in (Hallett et al., 2006) and (Portet et al., 2007).

3 Summary and Conclusion

We have developed a first prototype of the system which uses simulated data to produce handover reports. This runs on standard desktop PCs. For our second prototype, which is currently being developed, we port the NLG algorithm onto a GETAC Z710 tablet¹ which has been chosen for its robustness, capacitive touch screen, and long battery life (Figure 2). Our research also includes the establishment of a connection between the tablet and sensors, the recording of the incoming data stream and the development of an interface for the tablet, which can be used by the CFR to enter observations and actions taken or any other useful information.

At the ENLG workshop we will present our first hardware prototype alongside the desktop computer version, highlighting the challenges that the project faces in developing a handover report generator for pre-hospital care.

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¹http://en.getac.com/products/z710/z710_overview.html