MediPic: support for medication management

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ABSTRACT
This paper describes the initial design of a device to support the management of medication in a community care environment. From requirements identified through ethnographic study, the proposed medication manager offers an interface that reduces confusion for the residents of the care facility whilst also supporting the learning of self-management skills required for independent living. The prototype also senses actions of the users in order to promote an awareness between residents and staff.

Keywords
Interface design, assistive, ethnography, awareness.

INTRODUCTION
The Equator IRC 'Digital Care" project aims to examine the use of ubiquitous computing technologies to support residents and staff in a mental health care environment. Patients leaving psychiatric care in a hospital often move to a halfway-house facility before resuming an independent lifestyle. One such facility, incorporating a hostel and a number of semi-independent apartments, is the setting for this project. The goal of this site is to teach the residents routine skills to enable self-reliance. Using skills from a multidisciplinary research team including Ethnographers and Computer Scientists, the project has begun to develop prototype technology aimed at assisting in various aspects of the resident's integration back into the community. These devices will aid in the acquisition or reaffirmation of the 'real-world' skills necessary to function independently in daily life. However, our research has shown that an important design criterion for devices for use by the residents or staff must provide support in the development of skills without promoting a dependence on the technology.

The first stage of the project has adopted a 'needs-led' approach through the use of ethnography and techniques such as cultural probes [2] to identify important issues in the lives of the residents and staff. The results of this study are detailed in 'Design and Digital Care' [1]. These initial studies have highlighted a number of areas where the use of technology may be appropriate, such as the practical issues of personal security, the management of medication and in helping to deal with the isolation of living in a sheltered institution. This paper focuses on the design of a technology to support one of these areas: supporting the resident's medication regime.

BACKGROUND
The initial studies of the facility, including meetings with staff and residents have identified a range of concerns regarding the resident's medication. When residents are in the hostel, medication is managed by staff, who distribute the required doses of medicine at the correct time and record the information in a logbook. Residents are expected to manage their own medication once they have moved to the semi-independent living area. Weekly supplies packaged into individual doses within a plastic container known as a 'medipack', are prepared and distributed by the local pharmacy. This arrangement frequently causes anxiety and inconvenience for both staff and residents. Residents must now depend on their selves to remember what medication to take and when, leading to worries about missed medication, taking pills at the wrong time or even accidental overdoses. This leads to residents relying on staff to provide reassurance about the medication and in some cases reminders of when and what to take. This kind of reliance is of course, detrimental to the aims of the semi-independent unit and a solution that bridges the two stages is thought to be desirable.

Requirements
In order to achieve this intermediary stage residents primarily need a system that will reassure them that they are following the correct regimen, whilst leaving the management of their medication in their own hands. It is important that the system does not take over the task for them as many commercial products attempt to do by fully automating the dispensing of drugs at the correct time. The aim here is to encourage self-reliance and allay any fears of making a mistake, rather than automate the task and remove a cognitive load. In addition to these requirements it would also be desirable for the system to be aware of a residents actions i.e. sense when medication has been taken and adapt the interface to provide feedback. This data would also be accessible by the staff for monitoring the resident's progress. With the addition of communications capability the system may then be used to alert the staff to possible problems such as a deliberate overdose.

Furthermore the system could be used to establish a link between a community of residents and the staff, and provide awareness of others in that community. Data gathered by the system could be continually displayed for staff awareness of the resident's progress [3].

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resident has reassurance, should they need it, that they are taking the correct dose at the correct time.

The current prototype includes a proximity sensitive layer to allow some monitoring of patient's activities with the pillbox itself. A compartment sensor is triggered as a pill is removed. Although these events cannot be relied upon exclusively to assert that medication has been taken, lack of events can definitely state that medication has not been taken. This information may be used to alert staff to possible problems and is the first stage in developing the device as a link between staff and residents.

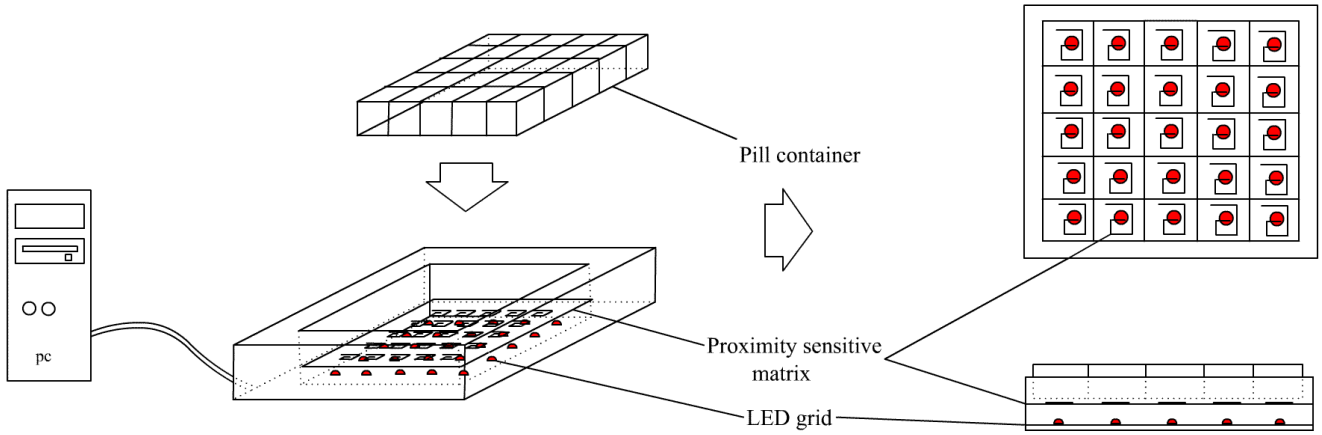

Figure 1. Prototype medication manager.

The current 'medipack' system consists of a simple box divided into daily compartments each partitioned into individual doses. This compact form-factor can be easily restocked and delivered to the residents and is carried over into the new design. Rather than apply any augmentation directly to the medipack, the computerized version consists of a replaceable 'cartridge' containing the medication and a separate housing containing the medication management device. *Figure 1* illustrates the design for the initial prototype intended as a starting point for a series of feedback workshops, which will allow staff and residents to participate in the refinement of the device.

The main issue faced in the design of this device has been how to provide an interface that would present information in such a way as to not promote dependence on the device. Even a simple reminder system, such as an audible alert, moves responsibility for management of the medication regime away from the resident. The interface must therefore be minimal and non-intrusive in order to promote the active participation of the resident and in turn reinforce the routine. In order to achieve this a simple grid of LED's was arranged to present two LED's (one red and one green) beneath each pill compartment. The LED's are controlled by a micro-controller circuit that illuminates the red light to indicate each pill that should not be taken (i.e. it is not the correct time to take the dose) or the green light to indicate the correct dose to take at the correct time. No other reminder device was employed and access to pills was not restricted. Presenting the information in this way shifts immediate point of engagement away from the interface and allows the resident to focus on the task at hand. By shifting the information to a peripheral position, the

FUTURE WORK

The prototype constructed from this design will be evaluated and refined through a number of on-site workshops, allowing both staff and residents to have some input on the form and function of the device. The next stage of design will focus on developing the link between staff and residents through the device. Communications capabilities will be added to explore the notion of peripheral awareness between a community of device-users. Following this, extensive reliability and dependability testing is required before field testing.

ACKNOWLEDGMENTS

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