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Intelligent Tutoring System: A Case Study of Mobile Mentoring for Diabetes

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ABSTRACT

Mobile devices offer considerable potential for educational applications, allowing users to learn when and where they want to. Recent health strategy has promoted the concept of the Expert Patient who has developed a high level of knowledge and expertise to enable them to manage their own condition. This requires focused instruction and health professional intervention. In this paper we discuss the development of an Intelligent Tutoring System that mentors diabetics, giving them the ability to develop the necessary expertise.

KEYWORDS

Diabetics, Mobile mentoring, Intelligent Tutoring System

1. INTRODUCTION

The prediction is that application development for mobile devices will explode with high growth in social, recreational and educational applications. The mobile market offers considerable potential for educational applications with an emergent trend in mobile learning for supporting health and leisure activities.

There is growing governmental awareness of the need for patients with chronic or long term health conditions to become Expert Patients skilled at managing their own condition rather than relying on the intervention of healthcare professionals. Current Expert Patient education entails structured clinic-based learning with regular follow-ups.

A number of alternative approaches to educating patients to manage long-term illness have been implemented, including patient education materials and on-line solutions. A potential approach is mentoring where patients are matched with mentors with more experience and expertise in the management of their condition. Ideally a patient should be able to consult with their mentor wherever and whenever needed, but providing such a mentor to each patient would be prohibitively expensive.

In this paper we discuss a mobile mentoring approach, where an Intelligent Tutoring System (ITS) provides a permanently accessible mentor to educate patients with Type 1 diabetes. In the following sections we consider Expert Patients (the intended users of the system), the problems of diabetes, Intelligent Tutoring Systems, and the development of the Diabetes Mentor system.

2. EXPERT DIABETES PATIENTS

Diabetes is almost a paradigm case among chronic diseases as it can have profound effects on lifestyle as well as health. Around 1.3 million people in England are diagnosed with the disease, of which 15% have Type 1 diabetes.

Research and practical experience has shown that long term health benefits can be achieved if diabetics are empowered to take responsibility for the management of their condition in partnership with their health and social care providers. By becoming Expert Patients, diabetics develop problem solving, decision making and resource utilization skills that allow them to effectively manage their blood glucose levels. It has been shown that tight control of blood glucose, either by insulin replacement therapy or by diet and exercise, can prevent or delay the onset of complications and increase life expectancy. However, such close control of blood glucose levels requires considerable effort and dedication by both the patient and the healthcare professionals.

A particular problem occurs with children and young people, who find it particularly difficult to control their disease – young people have significantly increased rates of diabetic emergencies, and their death rates are higher than young people without diabetes.

3. INTELLIGENT TUTORING SYSTEMS

The development of Intelligent Tutoring Systems has been a focus of applied Artificial Intelligence in education since the early 1970's ITSs attempt to undertake the same responsibilities as a human tutor in face-to-face education, The behavior of an ITS is determined by rules that allow the system to determine the selection and ordering of materials that should be presented to the student and allow the generation of appropriate advice and explanations.

ITSs have been developed for a variety of applications, although a number of ITSs exist to aid and train medics, there are relatively few ITSs aimed at patients... It seems likely that ITSs have potential to train and guide Expert Patients, however, there is currently little research published on this application domain.

An ITS to educate Expert Patients will be of most use if it is constantly available, such as on a mobile device. However, the technologies for implementing ITSs have not yet been adapted for delivery via such devices, largely due to the constraints of processing power and memory size, both of which are typically required for their successful deployment.

4. DIABETES MENTOR

This mentor will be run on a mobile device that will help patients with Type 1 diabetes mellitus to manage their condition. Diabetes Mentor provides the knowledge and skills of experts as healthcare professionals and experienced diabetes patients. This knowledge will then be made accessible on a mobile device to diabetics who are less able to manage their disease, such as children and young adults, and providing such support via a mobile phone may provide an additional motivational factor for such patients.

Diabetes Mentor monitors and documents adherence to a personalized regimen for maintaining near-normal blood glucose levels in Type 1 diabetics. It helps to educate users to understand and react to their condition by providing tailored information and supporting a range of tasks including a schedule of blood glucose measurements, an exercise plan, meal plans and/or nutritional recommendations, and a schedule of preventative care.

Diabetes Mentor assists the user to determine appropriate basal doses of slow acting insulin, and premeal doses of fast acting insulin in response to activity and nutrition related fluctuations in blood glucose levels. It provides instruction and help to the user using lay terms for all of its recommendations. In order to operate successfully the system will have a model of the dynamics of blood glucose levels relative to nutrition (including dietary aberrations), exercise, medication, stress and acute illness, in relation to the individual patient. It will also take into consideration special circumstances such as travel, driving and operating machinery. The system will also monitor and document complications of diabetes, such as hypoglycemia, infection (e.g. skin, feet), vascular disease and neuropathy, by periodically interrogating the user.

5. PROPOSED ARCHITECTURE

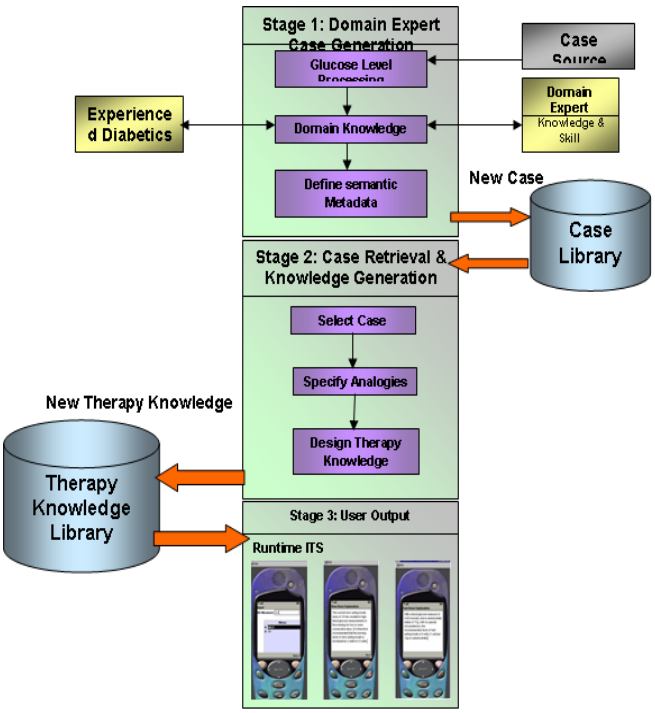

Fig 1: Proposed Architecture of Diabetics Mentor

6. CONCLUSION

- Developments in wireless communications technologies and move to hand-held mobile devices are forcing a re-evolution of existing technology infrastructures within a healthcare.
- It shares biggest contribution towards society by helping users to manage their long term diabetes disease.
- Expert's patients can manage their own condition rather than much relying on healthcare professionals.

7. FUTURE WORK

- To provide permanently accessible mentor to educate patients with Type 2 & Type 3 diabetes with their complications.

8. REFERENCES

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