

HL7 in Personal Health System component's integration for Mental Health Treatment (February 2010)

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Abstract— Help4Mood is a project inside 7th European Framework Programme (FP7) for developing a computational distributed system to support remotely the treatment of patients with major depression at home. Core components are integrated with Health Level Seven (HL7) standard. One of the main goals of this system is to use the paradigm of a Virtual Agent to support the first symptoms of clinician alert of a patient, to interact with him in order to prevent some causes of relapse. The system processes inputs from different devices (to monitor sleeping, eating and motor activity) in a decision support system, and the Virtual Agent interacts with the patient before clinical support from hospital is needed. The technical framework is using the open source HL7-standard-based healthcare integration engine, Mirth Connect, to interact with the different subsystems, analyze data and give different priorities for messages in queues. Particularly, the use of standard HL7 will contribute to interest in the project results and the potential impact through the development, dissemination and use, as stated in the analysis of the European commission

Index Terms— HL7, home healthcare, mental health, HL7 open source engine, virtual agent

I. INTRODUCTION

HELP4MOOD [1] proposes to significantly advance the state-of-the-art in computerised support for people with Major Depression by monitoring mood, thoughts, physical activity and voice characteristics, prompting adherence and promoting behaviours in response to monitored inputs. These advances will be delivered through a Virtual Agent, which can interact with the patient through a combination of enriched prompts, dialogue, body movements and facial expressions. Monitoring will combine existing (movement sensor, psychological ratings) and novel (voice analysis) technologies, as inputs to pattern recognition based decision support system for treatment management. The main aim of the Help4Mood system is to provide an approach for supporting the control, communication and treatment management of patients with major depression. This approach will be a distributed system with the three main components (the Personal Monitoring System, the Virtual Agent component and the Decision

Support System for Treatment Planning) deployed at patient's site.

One of the main technological objectives is to interconnect the different subsystems using standards, mainly HL7 in the application layer. For this purpose, i2Cat researchers have tested different engines that could be adapted for this heterogeneous environment. As an interesting comment, we must note that the Evaluation Summary report of the EC commission stated that "In particular the use of standard HL7 will contribute to interest in the project results", in the "Potential impact through the development, dissemination and use of project results" section.

II. HELP4MOOD PROJECT AND 7TH EUROPEAN FRAMEWORK PROGRAMME (FP7)

Help4Mood is an initiative funded by the 7th Framework Programme on 2009, in the call FP7-ICT-2009-4.5.1 for Personal Health Systems [2]. Help4Mood is a collaborative initiative of several European institutions, based in United Kingdom, Spain, Romania and Italy.

This project is funded by the objective addressed by FP7-ICT for Mental Health, specifically for ICT based solutions for persons suffering from stress, depression or bipolar disorders, where interdisciplinary research will address the parallel development of technological solutions, as well as new management or treatment models based on closed-loop approaches. Help4Mood emphasises the use of multi-parametric monitoring systems, which monitor various metrics related to behaviour and to bodily functions (e.g. activity, sleep, physiological and biochemical parameters). The proposed system will aim at (i) objective and quantitative assessment of symptoms, patient condition, effectiveness of therapy and use of medication; (ii) decision support for treatment planning; and (iii) provision of warnings and motivating feedback. In the case of depression, the system will also aim at prediction of depressive or manic episodes. The solutions will combine portable or implantable devices, with appropriate platforms and services. They will promote the

5. In this point, we are able to handle known messages. And, what happens with unknown HL7 messages? Chamaleon has a process where we define what to do with these kind of messages. We can apply specific logic when we catch unknown messages.

6. Perhaps, we want to modify a HL7 message data before we map to programming language data structures. Chamaleon lets do that. We can define little Python scripts for changing strings or other kind of data contained in HL7 message.

7. The last step involves how can we work with repeated messages. Repeated messages are a problem for simpler data structures. We need to create specific complex data structures for this kind of messages. Chamaleon has an automatic process for defining these data structures.

B. Mirth Connect

Mirth Connect [4] is an open source option for a full HL7 message handling framework. It is a rich interface channel development and real-time connection monitoring environment.

Mirth Connect supports a lot of protocols for connecting to external systems. Any of this protocols are: MLLP, HTTP, S/FTP, Email, Files (PDF, RTF), JMS or Web Services. It also uses a variety of standard messaging protocols like HL7 v2.x, HL7 v3, X12, XML, DICOM, EDI or NCPDP, allowing to perform message filters for catching interesting data contained into messages. Like Chamaleon, it allows transform message before apply a certain filter, too. User can create user-defined rules which Mirth will take a specific action when matching with certain rule. That action can be sending an email, storing data in a database, call a remote procedure in a Web Service, and much more. Mirth Connect works with a self contained application Jetty server. For this, it is written entirely in Java. Channels are deployed into Mirth Server and can be monitoring and configured remotely through Mirth Administration interface.

IV. RESULTS AND DISCUSSION

Today, in medical environments there are different ways to represent medical data in computer world. This is a real problem if we need to share certain data. For instance, patient information needs to be revised by two or more area specialists to perform a diagnosis. To avoid this problem hospitals and medical clinics use HL7 as a standard to represent medical information in computer world. As we said before, HL7 has a very complex syntax for a human and we need tools that monitoring messages through over the network, parse it extracting interested data for us and take any action with data (send an email, store information in any physic medium, store data in database).

Mirth works under self contained server called Mirth Server (Jetty application server). We can deploy different channels for each different data we need. We can perform one or many actions for each channel. This means that when a channel detects an interesting type of information for us (previously configured), it will extract that information and will take one or many actions.

However, how can we configure a channel? Mirth provides Mirth Administration Tool which can monitor state of channels and configures each channel (including actions).

This way, we can focus us in our specific problem and delegate HL7 messaging problems to Mirth. For instance, if we store HL7 messages data in a database (Mirth problem), we only have to handle that information for our needs (our problem). Other example can be if we have our logical in a web service. We can to do that Mirth send a request to our procedure in web service with right parameters (extracted from HL7 messages) and send an email to certain email address to alert someone.

In short, for all this advantages and because it is open source Mirth is tool we have selected for HL7 messaging functions.

V. CONCLUSION

Nowadays, the Personal Healthcare Systems (PHS) is one of the emerging fields [5]. In PHS there are several fields where lot of research has to be done and still going on in the future there endless scope to do work in personal healthcare too.

There are future directions of the development of this home health systems, and integration and interoperability of the components that collect, transmit and processes these data, will use standards as HL7 to maintain the compatibility of the whole system.

ACKNOWLEDGMENT

The authors thank Help4Mood consortium for their contributions to this project.

The team involved in this project will also thanks:

- i2Cat Foundation's, Department of eHealth and eDependence members.
- European Commission for their interest on and financing of Help4Mood project.

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