Organs Transplantation

How to Improve the Process?

Viriato Ferraz, Gerardo Oliveira, Pedro Vieira-Marques, Ricardo Cruz-Correia
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Motivation

→ The number of available organs is much lower than the needed
  - growing size of waiting lists for donation

→ Transplants must be performed in a short period of time in order to achieve satisfactory results (from 6h to 8h)
  1. Identification of brain death and potential donor by doctor (e.g. ICU)
  2. Communication to Coordinator Office (C.O.)
  3. Validating of donor by coordinator office (C.O.)
  4. Histocompatibility tests
  5. Perform the transplant

→ Timely and optimized communication between health professionals is often referred as an area of improvement
Organs Transplantation - How to Improve the Process?

Local motivation (North of Portugal)

- High number of patients being monitored
  - Hard to perform timely validation of all signs indicating **brain death** to each specific patient
  - When signs are missed a **race against time** starts

- Hospital S. João (HSJ), a large Portuguese hospital numbers
  - In 2008, 65 potential donors, **12** not validated in time
  - In 2009, 61 potential donors, **19** not validated in time
Software Agents

- Agent is a complex software entity capable of acting with autonomy in order to accomplish tasks on behalf of its host.
- An agent is defined in terms of its behavior.
- Agents are defined regarding its
  - persistence (code runs continuously and decides for itself when it should perform some activity)
  - autonomy (agents have capabilities of task selection, prioritization, goal-directed behavior, decision-making without human intervention)
  - social ability (agents are able collaborate on a task)
  - reactivity (agents perceive the context in which they operate and react to it appropriately)

- Agents have been used to improve workflow and information flow.
Aim

→ Design and implement a multi-agent software platform to assist the information flow between hospitals and coordinator offices (C.O.)

→ So that C.O. accesses information of potential donors before and during brain death tests
Several meetings with C.O. of HSJ to determine data that allows C.O. to early identify possible organs donors

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<th>Area</th>
<th>Description</th>
<th>Data Type</th>
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Health Informatics Group - http://cintesis.med.up.pt
Developed system

→ Agent based system
  → JADE and MySQL
→ Main agents
  → Health care unit agent (e.g. ICU)
    → Signalize patient as possible donor to C.O.
  → C.O. receiver
    → Receive and process possible donor from health care units
    → Receive and process possible donor from other C.O.
  → C.O. sender
    → Send updates to other C.O.
→ Web-based human interface
  → Java (JSP) and MySQL
Discussion

- The pilot has been successfully developed

- Evaluation by users
  - C.O. users find it useful
  - ICU doctors ask for integration with their existing EPR/Monitoring systems

- The developed system has the potential to reduce 1h+ in the process due to early notification of C.O.
Future Work

→ Implement communication protocols with EPR

→ Study new healthcare scenarios suitable for multi-agent systems

→ Searching, negotiating and retrieving specific patient information distributed in different hospitals before user request (doctor or patient)
Thank you for your attention

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CINTESIS – Health Informatics Group

- Patient records
  - Central repositories
  - Departmental Patient Records (O&G, Breast, ICU, …)
  - Regional networks
  - Information and work flow improvement

- Security
  - Role-base access control

- Knowledge discovery
  - Data mining
  - Performance indicators
  - Log analysis (audit trails)

- Technology assessment