IRIS PATIENT IDENTIFICATION SYSTEM

Graham Blair, Angela Liu, Mark Tull

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with iRespond.org
Problem
2 Part Problem

1. **Identification** of patients in developing world is very difficult.

2. **Medical Records** in developing world are poor or non-existent and difficult to access/use.
Patient Identification

• Very difficult in developing countries

  • Lack of infrastructure
    • Lack of national accounting/tracking of citizenry (eg, USA SSN)
    • Lack of photo ID cards
      • means of authenticating cards…

• Linguo-Cultural hurdles
  • Maybe not enough names in language/dialect to accommodate entire population
Medical Records

- Often little or no records kept in developing world
  - (logistical issues)

- If records are kept, often of little use
  - Social Constraints
    - Similar to ID problems
      - (No national ID system, no photos, language, etc.)
    - Additionally:
      - Security/privacy concerns can cause poor record-keeping
Medical Records (cont.)

- Paper medical records may be of low value
  - Nomadic populations, mobile providers

- Electronic Medical Records (EMRs) may be of low value (or not used) because
  - Access problems
    - poor connectivity (e.g., rural areas)
  - Hardware/Software problems
    - no hardware
    - power problems
    - language input issues (keyboard, software language support)
How is identification done now?

- Frequently, by recruiting locals to help ID people
  - Translators
  - Tribal/village elders, etc.
  - “Connectors” (to use Malcolm Gladwell’s term)
- Unfortunately
  - Expensive / Difficult / Not always available

- …It’s done as best it can be per situation
  - Sadly, the results are often unsatisfactory
Who needs this? Who will it affect?

• Healthcare Workers and Researchers in Developing World
  • Providers, Researchers
  • Analysts / Policymakers
    • BONUS: in developed world

• Funders
  • Governments, NGOs
Solution
IRIS | Biometric Patient ID and EMR system

Scan → ID

- Retrieve Record
- Create Record

Access EMR
Project Description

Major Components

• **Device**
  - Smartphone, etc.

• **Fingerprint scanner**
  - or other biometric

• **Database**
  - Cloud-based, primarily
    - Local: temporary, caching, etc.
    - Remote: (sometimes)
Project Description

Stakeholders

• iRespond
  • IRIS
    • preliminary testing of some elements
  • other systems

• Thailand
  • Ministry of Public Health
  • Two universities participating
Design Challenges

• **Device Agnostic**
  • Browser-based

• **Language Agnostic**
  • Input only numerals (outside EMR)
  • Numeric-only SIDs

• **Users may have <HS equivalent education**
  • GUI

• **Globally scalable**
  • Numeric only SIDs (can’t use alpha characters)
  • Length of SIDs
Related Work

• ODK (Open Data Kit)

• India’s UIDAI project
  • 2010: biometric backed UIDs
  • 600 million by 2016
Findings so far

- Met with iRespond
  - Other biometrics possible in future
    - iris scanning, palm scanning, voice printing
  - Planning architecture is complicated
    - security, anonymity, scalability
      - securely assign UIDs
- Designing UI is difficult
  - universality, language
Basic Scenario
Architecture - Fingerprints

Lossless Image
Huge!

Template Creation Process

Template File
Very Small
Architecture - Verification

Create and Send Fingerprint Template

Yes – Return ID number.

Match found? (>80% match)

No – Prompt for enrollment.

Fingerprint DB
**Architecture - Storage**

<table>
<thead>
<tr>
<th>uid</th>
<th>template</th>
</tr>
</thead>
<tbody>
<tr>
<td>853461885514</td>
<td>fingerprint</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>uid</th>
<th>name</th>
<th>dob</th>
</tr>
</thead>
<tbody>
<tr>
<td>853461885514</td>
<td>John Doe</td>
<td>2012-12-21</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

Eleven regular, random digits. $10^{11} = 100000000000$

Different possible ID numbers.

Verhoeff Check Digit
Architecture - Localization

- - Not Immediately Accessible - -

Cloud

Temp ID & Template

Temporary On-Device Storage

Auto-Sync on Connection
Design and Evaluation

• Prototype/UI iteration:
  • iRespond feedback

• Evaluate
  • User testing
    • locally
    • field by iRespond staff
  • Criteria
    • success/failure of functions
    • used or avoided
    • effect on work
Plan for Next Quarter
Next quarter (rough plan)

• **First**
  - Finish Backend Development
    - Database, interaction with fingerprint scanner, etc.
  - Finish UI Design
    - Test paper prototypes in laboratory

• **Second**
  - Local testing of system
    - Evaluation, iteration
  - Execute Field Testing

• **Third**
  - Write-up / Present
Questions?

This presentation was on the IRIS system by iRespond.

We are Graham Blair, Angela Liu, and Mark Tull.

Thank you for your time.