Freedom Fone interactive voice for Emergency Data Exchange

Slides
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M. Silva\textsuperscript{1}, K. Perera\textsuperscript{2},
T. Wilfred\textsuperscript{2}, and N. Waidyanatha\textsuperscript{2}

\textsuperscript{1}Lanka Jathika Sarvodsaya Shramadana Sangamaya
\textsuperscript{2}LIRNEasia

\textbf{LIRNEasia}
\url{www.lirneasia.net}

\textbf{Sarvododaya}

\textbf{SAHANA}
LIRNEasia is in EWS space of DM; i.e. **HazInfo**:
- Webhamuwa, NEWS:SL, Dam-safety, LM-HWS, CB, Biosurv, FF4EXL
- Bleeds in to "preparedness" and "response"
  - "plans w/o drills and drills w/o plans are useless"
- Advocate interoperability
  - common procedures (reg. of alert autho)
  - data standards (e.g. EDXL)
Sarvodaya Samana Thetha Emergency Information Needs

Situational Information Communication Procedure

- Community members (victims or associates)
  - call the District or Head Office
  - report of incidents.
- Collect ground truth
  - 2011 Floods, SCDMC dispatched youth with cameras, laptops, and dongles
- Blog situation on www.sarvodaya.org
- Get word to media and donors
- Secure response resources

Sarvodaya’s relief efforts continue
Sarvodaya made relief teams of professionals to the region hard-hit by the floods for support, fact-finding and needs assessment. Most urgent needs remain food and shelter. Technical and needs assessments continue.

On January 16, in part of relief to the disaster situation, Sarvodaya set together a group of experts to travel to Thoppigala, Bettina in the Eastern Province. The team comprised doctors, emergency medical professionals, disaster management professionals specializing in water purification and waste disposal, and social workers. The contingent traveled to Thoppigala to engage in relief efforts and provide medical support to flood victims.

After meeting with the Security Forces Commander for the Eastern Province, General Endingana, the team was asked to cater to the needs of the 13,000 people in Thoppigala. Access was possible only by
Sarvodaya use telephones to communicate, daily/weekly, IDP Info

2003 to 2011 Sarvodaya District Staff Responded Hazard Categories (n=51)

<table>
<thead>
<tr>
<th>District</th>
<th>Tsunami</th>
<th>Landslide</th>
<th>Floods</th>
<th>Cyclone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colombo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mataara</td>
<td>12</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Nuwara Eliya</td>
<td>16</td>
<td></td>
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<tr>
<td>Ratnapura</td>
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Sarvodaya Emergency Information Communication Frequency (n=51)

<table>
<thead>
<tr>
<th>District</th>
<th>Weekly</th>
<th>Several times a Week</th>
<th>On Request</th>
<th>Daily</th>
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</thead>
<tbody>
<tr>
<td>Colombo</td>
<td></td>
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<tr>
<td>Mataara</td>
<td>15</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Nuwara Eliya</td>
<td>10</td>
<td></td>
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<tr>
<td>Ratnapura</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

Sarvodaya Emergency Information Communication Methods (n=51)

<table>
<thead>
<tr>
<th>District</th>
<th>Telephone</th>
<th>Telephone, Fax</th>
<th>Telephone, Hand-deliver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colombo</td>
<td></td>
<td></td>
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<tr>
<td>Mataara</td>
<td>15</td>
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<td>Nuwara Eliya</td>
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<td>Ratnapura</td>
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</tbody>
</table>
Positioning Interactive Voice for Emergency Communications

- Dropped calls high during hazard events
- Intuition - voice best after the 6th hour
- During response phase for Community Emergency Response Team (CERT) members
Alerting sequence with actors and functions

- Sinhala/Tamil cap messaging
- Enable voice interfaces Sahana
- streamline
  - implement TTS, it's easier
  - upload to FF & SABRO
  - Create FF menu
  - SMS until acknowledged
Proposed Text To Speech Procedures for CAP

- CAP message created with received hazard information
- Message is transformed to audio and posted on FF-IVR
- Alert the recipients with a SMS that carries the call back phone number
- Users call back and listen to the alert through FF-IVR
Reporting sequence with actors and functions

towards automation

• STT is harder
  ◦ Trained system limits users
  ◦ Untrained system limits quality
  ◦ Voice quality not enough

• Sinhala/Tamil typing or transliteration is better?

• "Skilled" crowd sourcing (HIH capacity)
Proposed Speech To Text Procedure for SITREP

- CERT member call the IVR to record a message
- Incident managers will add other information on top of what was received on the final report
Sarvodaya Hazard Information Hub (data center)
Infrastructure

VSAT (dysfunctional)

WiMax Tower

WiMax Antenna

GSM Tower (Voice/Data)

WiMax Router

scdmc-srv (test)

Terminal switch

samana-thetha-srv (production)

2N Officeroute
Research Design

Lanka Jathika Sarvodaya Shramadana Sangamaya

Hazard Information Hub @ Community Disaster Management Center, Moratuwa, HIH Manager, 3 HIH Operators

Four Districts: Colombo, Matara, Nuwara-eliya, Ratnapura, ~ 10 - 13 CERT members from each district: Divisional/District Coordinators, Staff
Evaluation Method

Controlled Exercises (human action cycle)
1. Discussed operating procedures (goal, intention, action)
   • Executed those procedures (execution, perceiving, interpreting SoW)
   • Evaluated the outcomes (Performance, Usability)

Complexity:
• Interaction techniques (HCI)
• Reliability - mean time to completion & voice quality (ITU-T)

Usability:
• Human action cycle (HCI)
• Gulf of execution/evaluation (HCI - what system allows/understanding of SoW)

Utility:
• Ease-of-Use, Usefulness, and Attitude (TAM)
Sarvodaya Community Emergency Response Team Experience
"Present Sarvodaya methods are ad-hoc and informal unaccountable, but Freedom Fone stores a record of the story ... no one can say otherwise."
Alerting with Freedom Fone

Avg. Call Time: 2:13 min
Avg. Msg Time: 1.59 min

Menu selection sequence:
1. Language (press #1 for sinhala)
2. Listen to Alerts (press #1 for Alerts)
3. Select to Alert (press #2 for "landslide in Ratnapura 2011 Nov 10")
Reporting with Freedom Fone

**Avg. Call Time:** 2:33 min  
**Avg. Msg Time:** 1.38 min

Menu selection sequence:
1. Language (press #1 for sinhala)
2. Submit a Report (press #2 for reporting)
3. Begin recording after the beep
4. Save report (press # to save, press #1 to listen, press * to delete)
General observations, CERT multiple attempts with Freedom Fone

• User who claimed Freedom Fone to be difficult had not been exposed to IVR prior to this; i.e. dial a number of occasional SMS

• Unlike mobile or computer application with display, IVR has no visual of transitions; hence, sometimes get lost in the menu trees

• Frustrations caused by unbranded cheap phones not interacting well (e.g. keypad entries not recognized)

• Forgetting to use special keys; e.g. press # key to commit a voice recording
Sarvodaya Hazard Information Hub
Operators Experience
Circuit (or mechanical) noise degrades MOS ~ 50% bad, poor, and fair

- Partial, Unclear, or Missing information can lead to false predictions/actions and inefficiencies, ~30% of info was difficult to decipher
- All telephone samples at data center worse than on-site digital recording
MOS classifier performance predicted with DS

- Optimistic cut-point MOS=4 for DM systems
- 7% of time can go wrong

Patterns of urban (Matara, Colombo) rural (Ratnapura, Nuwara-eliya) divide
- Except Colombo all others agree ~80% with classifier
- Colombo behavior could pure chance?
- Sahana CAP and SITREP messaging are most time consuming; tasks (1), (2), (11), & (12)
- Some expected latency in listening to Freedom Fon audio alert and acknowledging (only 4 GSM channels)
- Freedom Fone audio processing tasks (3) - (7) are fast
HIHO Action Cycle (Colombo District Exercise)

Smoother but delayed, developers/implementers did not config/test user's machine (i.e. tech failed on day of exercise!)

HIHO Action Cycle (Matara District Exercise)

Unsmooth - lack of streamlining controls and decoupled systems

- create SABRO CAP msg
- translate voice-text on paper
- record MP3 voice alert Audacity
- upload new voice alert to FF
- issue SMS alert from SABRO
- waiting for acknowledgements
- review acknowledgements
- translate FF audio incident reports
- create new SITREP in Eden

App Hops

Sahana Agasti
Audacity
Freedom Fone
Freedom Fone
Sahana Eden
- Feedome Fone SITREP cumbersome translating and determining English disaster terms with diverse range of incident reports.
- Frustrations with Web2Py and PHP disagreeing to coexist.
- System services like Cronjobs interfering with system continuity.
Recommendations

• Can't draw "for-all" conclusions not big enough sample/research but provides insight to design needs

• Points to need for single application with streamlined and automated processes to increase inefficiencies

• Transliteration or localized text entry will increase Sahana usability in Sarvodaya context

• Forget about STT (4%) or TTS (71%), technology still primitive for local languages in Sri Lanka
• Daily use of Freedom Fone for Sarvodaya business will make always ready to use and CERT will be competent

• HIH should put it to use in next disaster; but system failed during Matara Mini Cyclone

• Integration of Freedom Fone or any Voice-based interface in to Sahana will increase its acceptability and usability.

• Freedom Fone should establish it's "foundation"
Next steps

1. Build CAP messaging into Eden
2. Consolidate Eden-SitRep with RM, IRS, and other already available components
3. Integrate Freedom Fone with Sahana
4. Automate the easy and intuitive processes
5. Improve localization for Sinhala/Tamil text entry
6. Conduct quasi experimental evaluation

Proposal, URS, SRS, Eval/Results, Technical Report
See Project Page: http://lirneasia.net/projects/2010-12-research-program/ff4edxl/

Thank You