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Case Study: REUNITE

Harnessing computer intelligence to revolutionise disaster response

The challenge

Aid organisations' processes are typically manual and labour-intensive and, although charities like the Red Cross have established public search facilities, no universal systems are in place. Personal details gathered by relief workers are usually stored in paper form, which is vulnerable to loss, damage and illegibility, and finding people's missing relatives requires a daunting, error-prone search through thousands of Polaroids.

The University of Manchester solution

A 'Concept and Feasibility' knowledge transfer project brought Tearfund together with computer scientists at The University of Manchester, to investigate potential uses of mobile and intelligent systems technology. A team from the Machine Learning and Optimisation Group developed a proof of concept incorporating three software prototypes, to address different aspects of disaster scenarios:

- **REUNITE** is a mobile and web platform to help reunite people separated within refugee camps. It allows aid workers to record information from missing people's relatives on smartphones rather than paper and upload it to a central server, where it is quickly transcribed, validated and analysed. Colleagues away from the scene can then collate the data with further details gathered using social network-style techniques, for secure downloading by colleagues coordinating reunions on the ground.
- **Where's Safe?** is an evacuation management system that quickly points people towards safe zones with sufficient supplies following a disaster. Designed to replace emergency radio broadcasts, which fail to reach large numbers of people, the software checks people's phones and directs them to the nearest safe location via an SMS message, sent using the robust GSM network.
- **HeightCatcher** is a smartphone application that enables relief workers to quickly identify infants suffering from malnutrition, and works out the quantity of fluids they need. A child's Body Mass Index (BMI) is calculated by using the phone's camera to measure their height and entering their age and date of birth, enabling the app to instantly assess malnutrition levels and what food or fluids they need.

"The Reunite concept is an example of much needed innovation in the relief and development sector. It not only has the potential to improve efficiency, but also creates opportunities for the general public to engage much more fully in disaster response."

Jon Kennedy,
Operations Manager
(Afghanistan Southern Sudan),
Tearfund

tearfund

Tearfund is a Christian relief and development agency working in over 40 countries to help eradicate poverty. This activity includes specialist areas such as water and sanitation, shelter provision, nutrition, trauma counselling and HIV work. Tearfund is a member of the Disasters Emergency Committee. Recent disaster responses have included the East Africa food crisis, Pakistan floods and Haiti's massive earthquake.

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The benefits

Working with the School of Computer Science exposed Tearfund to emerging technologies and innovative solutions.

- With REUNITE, reuniting families becomes quicker, easier and more secure
- Its 'crowd-sourcing' techniques make missing person details available securely to an unlimited number of users online, considerably increasing the available workforce
- Machine learning techniques identify and champion the most capable users, and improve the reliability of tasks carried out by 'the crowd'
- Where's Safe? enables aid workers to control and coordinate muster points easily, dynamically and efficiently, considerably improving their ability to protect and support disaster victims
- HeightCatcher is much faster and more accurate than using cumbersome wooden measuring tools, enabling malnourished children to be identified and helped more quickly
- A HeightCatcher map interface identifies areas of high malnutrition, allowing teams to divert food and water to the areas of greatest need.

> "REUNITE has been an exceptional learning experience for all involved, opening our eyes to potential new application areas for our ideas. The experience gained from REUNITE will filter down through our group for many years to come."
>
> *Dr Gavin Brown,*
> *School of Computer Science,*
> *The University of Manchester.*

The project has also been highly beneficial to the academic team, exposing it to an important real-world need and offering its Research Assistants valuable engineering experience. Tangible outcomes include several proofs of concept for its machine learning research and a large software framework for mobile intelligent systems, which it plans to exploit in the near future.

"We've gained a strong understanding of the crowd-sourcing and machine-learning models, which will inform our research direction in the coming years," says Dr Brown. "And the experience we've gained of applied industry projects, and the objectives, uncertainties and priorities involved, has been invaluable."

The Reunite project has established that smartphone technologies could significantly ease the financial and emotional burden on aid organisations, and help save hundreds of thousands of lives in the aftermath of disasters and humanitarian crises. "We've demonstrated that mobile intelligent systems can be deployed in low-power, high-risk environments, to the benefit of all involved," says Dr Brown, "and hope that the refugee aid community will strongly benefit from such technology over the next few years."