CSC318
The Design of Interactive Computational Media

Project Phase 10:
Final Report
&
Usability Evaluations Results

Team Name: Rescue Team Sect. 318

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Introduction

In today's day and age, we have more technology and mediums available to us to rapidly transfer information than we've ever had before. Unfortunately, our emergency response system is having trouble keeping up with the technology. We still use archaic methods such as dialing 911 and speaking to the operators which creates a lot of unnecessary delays when we have other technologies which can report an emergency at a much faster rate. It is our goal to focus on the problem domain of optimizing emergency response times, which we will do through the use of technologies available to replace the outdated emergency response systems stated above. What is so interesting about this problem space is the potential there is to save lives. Using modern technologies to save even one life makes research in this area well worth the investment.

Related Work

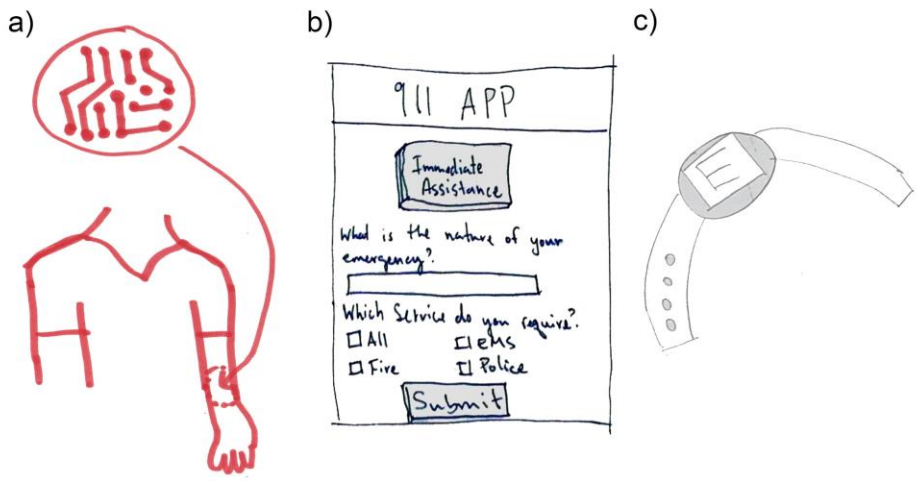
Before we could work on a solution for a problem in the topic of disaster and emergency response, we needed to first explore the problems that currently exist in this topic area, and the existing solutions, so that we know we are not unintentionally repeating previous work. One study in the topic area involved using a network of mobile robots and wireless sensors to facilitate the problem of search and rescue, using a chemical accident as proof of concept (Wang et al., 2010). Another problem in this area is dealing with the massive amount of unstructured information that becomes available in an emergency (for example, from social media). The Humanitarian Assistance Ontology (HAO) was created to solve this problem (Jihan & Segev, 2014); it identifies concepts like "crisis need", "place", "event", and subsequently generates recommendations for how to respond to the emergency. The 911-NOW (Network On Wheels) system was proposed for the situation when disasters damage network infrastructure (Abusch-Magder et al., 2007). It essentially serves the purpose of a mobile, self-sufficient network, with multiple interfaces (GSM, IEEE 802.11, etc). It is especially meant to be used by responders in the scenario when the existing centralized network infrastructure goes down and safety organizations still need to communicate.

User Needs Research and Results

Since we were targeting the problem of communication between responders and victims, we had two user groups to target our user needs research towards. We created two research instruments; one of which was a questionnaire for responders designed to answer the question of what information responders deemed most important to know about during an emergency, and the best way to relay that. We noticed that responders usually prioritized (from greatest to least) hazard and victim locations, victim health, and *then* their own health. Responders rated wireless sensor networks, smartphones, GPS, and Geographic Information Systems as critical technologies for their line of work. The second instrument was an interview which had questions designed to extrapolate difficulties victims face when transcribing their situation as well as while waiting for rescue. We learned that while waiting, victims wanted to know about the Estimated Time of Arrival of responders above everything, and some of our more altruistic victims wanted to know about the location of other victims so they could help them (or just to feel safer). Victims felt that the current 911 calling system was sluggish and they preferred to seek shelter first because calling would take too long, they may need to wait for someone to pick up the call, and 30 to 60 seconds of transcribing the situation could be too long. Also, there could be a language barrier if they were in a foreign country.

Ideation

For our ideation phase, our group used a brainstorming procedure adapted from Google Ventures and discussed during the week five tutorial. At the beginning of the brainstorm session, we decided on the high level problem of “using technology to optimize emergency response time.” We then each took five minutes to make quick sketches of eight different ideas that could solve the problem, followed by a second five minute session of the same process. After that, we each picked our top three of the sixteen ideas that we came up with to share with each other as a group. We then commented on each other’s ideas and offered suggestions to improve them. Finally, we each made storyboards for our best idea, which we then used to decide on the smartphone emergency application that we prototyped.

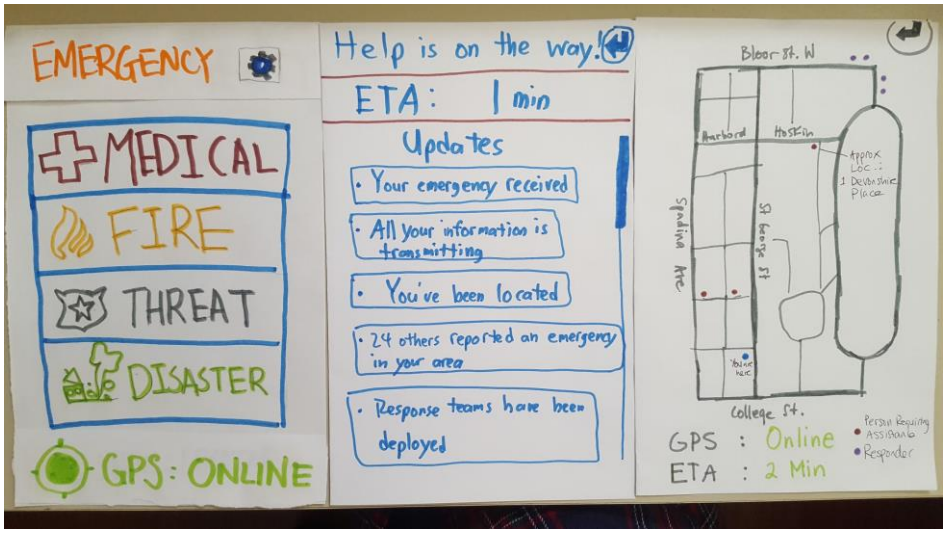


(a) Emergency info transmitter skin implant (b) 911 phone application (c) Emergency watch

Prototype Description

Paper prototype

In the first paper prototype, the first screen would have the emergency situation menu where you pick the emergency you are in with a GPS status is located at the bottom of the screen. After selecting the type of emergency you are in, you are then sent to the Medical Emergency page where there are 3 sections called updates, suggestions, and a map. The updates section expands into a full list of all updates in a list format. The message at the top and ETA Medical Emergency is also on this screen as well. Expanding the map in the Medical Emergency page shows a new screen showing the map around the user and the responders via a purple dot. A legend is on the bottom right denoting the color scheme of the responders and the user.. The suggestions section expands to a new section listing the suggestions with possible subsections that can aid the user.



After having a fellow student critique the paper prototype given the task generated in tutorial, a second paper prototype was created with the recommendations in mind. These include having a back button to go back a screen, making the text in Medical Emergency be more clear, including the ETA Medical Emergency on every screen, and finally adding a settings feature to allow certain features based on the conditions of the user. These changes were shown by having a gear icon beside the emergency title, a icon beside the gps Medical Emergency with the word “online” instead of “locatable”, the ETA has its own section right under the “Help is on the way” message, the GPS and ETA are also shown below in the map screen.

Our final Hi-Fi prototype has improved a lot on the visual aspects in addition to the paper prototype of our application, also more features are explored and implemented based on some feedbacks. The final product consists of reporting an emergency, then immediately being able to view the most recent updates and suggestions, the option of live chat with responders, call a responder and viewing responder location on a map.

Usability Research and Results

To conduct usability research we first came up with a set of tasks that would be crucial to making a functional 911 replacement that addresses the user needs we researched. We decided on three tasks that would meet these user needs. Firstly and most importantly, a user needed to be able to report an emergency situation.

Secondly, we asked users to be able to view live updates that responders had sent to the app. And finally, we asked users to send an update to the response team.

We began conducting our testing by presenting the first iteration of our paper prototype described above to prospective users and having them attempt our first two tasks. The testers provided us with valuable feedback such as using more understandable terms, for instance instead of “locatable” the app should just report if the GPS is online as “locatable” is a strange term. One of our testers, a regular iOS user, noticed that we hadn’t included a back button, which is necessary on that platform, and so couldn’t go back from the map screen to the view updates screen. Additionally, in the “view updates” task, a user pointed out that it was difficult to notice the ETA of responders as we had tucked it away at the bottom of the screen. We then took this constructive criticism and produced a second paper prototype (figure x), which addressed the problems from this test phase.

The second paper prototype was then given a brief test to confirm that the tasks could be completed, after which we decided to move directly to a hi-fidelity prototype, which we created with the myBalsamiq web application. To test this new prototype, we asked a participant to report that their friend was having a heart attack through the application, and proceeded through the other usability tasks. The key takeaways from this test were: we hadn’t implemented a confirmation button to prevent pocket-dials, the update screen we had implemented was far too dense and filled with text to be useful in an emergency, the back button we had used didn’t present its function clearly, and finally, that we should include an option to talk to an operator as in a traditional 911 call.

As a group we then discussed the results of the hi-fidelity prototype test, and decided to implement changes to address all of the usability issues, which can be seen in our final prototype accompanying this document.

Visual Design

In designing our 911 smart phone app, we made design decisions based on making the app as easy to use as possible for as wide of a population as possible. One of these design decisions is visible on the main screen of the application, where we have associated the type of emergency with both a representative colour and image. In this manner, even if a user can’t read in english, they can still recognize which button they should be pressing to report their emergency. Another design

decision that should be apparent on the main page, is that we've decided to use white images and fonts on top of the coloured background in order to make the text stand out better (especially for the black background of the disaster button). Additionally, throughout much of the application we have laid out buttons in a very simple row format. This was done to make the app as straightforward to use as possible, as we recognize that some of our users might not be as technologically inclined as other users. Finally, we've made some aesthetic choices that are meant to fit in with a typical iOS or Android application in such a way that users are presented with a familiar UI from the moment they turn on the application. One such example of this aesthetic can be seen in the Google-style map that we've included to show the location of responders on the screen.

Conclusion

Through a large set of feedbacks we are able to improve accessibility of the application. We realized that many victims during an emergency situation would like to be notified when help will arrive and how to be safe in the meanwhile, so the user-centered design was used to help victims provide all the info they need to be as comfortable as possible during an emergency. We are quite happy with prototype as it is able to handle much more emergency requests at a much larger capacity without the need for any operators, which is crucial in situations where many people are calling in an emergency at once and flooding the phone lines. If we were to continue developing the prototype, we would likely be improving the accessibility of this application such as allowing voice control and sending voice recording. This would be very helpful for the people who are incapable of using their hands during an emergency to still be able to send their current information to responders.

References

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