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# Heroln: An Assistive Medical Android Application for Common Diseases and Injuries

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**Abstract** – This study aimed to create an offline mobile application that assists users with disease or injury by recommending hospitals based on input of symptoms, providing contact information of these hospitals, and instructing first aid in case of injuries. The application was created using MIT App Inventor and runs on at least Android version 2.3.

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**Introduction.** – At present, more and more Filipinos use smartphones. The International Data Corporation reports that among all the members of the Association of Southeast Asian Nations (ASEAN), the Philippines is the fastest-growing market for smartphones [1]. In 2016 alone, there were approximately 26.2 million smartphone users in the country; the number was predicted to rise to 30.4 million by the end of 2017 and 46.04 million by 2022 [2].

Along with the popularity of smartphones spawns the development of mobile applications, or apps, that are used in everyday life. These include social media applications, photo and video sharing applications, and music and video streaming applications. The most used smartphone apps include Youtube and numerous social media such as Facebook and its accessory app, Messenger [3]. The idea that people have many options for entertainment or interaction with other people via the internet means that there are already many applications dedicated to the social and leisure aspects of life; however, there are other aspects that may not usually receive enough attention from app creators and developers but can be used as ideas to make an application. This gives way for the potential of creating novel applications that usually do not share the same functions as other apps. An example of which can be an application that addresses referrals to hospitals or first-aid instructions.

Currently, there are existing online diagnostic websites that help users identify what illnesses they may have through an interactive symptom checker. One example is WebMD, where the user can input identified symptoms in which the site responds with possible diagnosis of dis-

eases. WebMD can be accessed as a smartphone application; however, not all smartphone users have access to internet at all times, especially when travelling. This is why some mobile applications make use of features that do not require an internet connection. These applications make use of local storage so that they can be used with or without an internet connection.

Hence, the concept behind WebMD might be used as a basis in creating a novel application that has different features but shares a certain function.

It would be beneficial for Filipinos who are not feeling well or are injured to have immediate access to helpful information regarding the implications of their illness or injury. It would also be helpful if they had access to suggestions on what to do next depending on the urgency of their situation. The creation of an application for this might help attain that convenience for Filipino smartphone users.

It could be started off simply as a program in which users can input symptoms or injuries, for example. The app would then deduce possible diseases and recommend a hospital that may have a special facility for that possible disease, or the app would then provide first aid information if a user inputs an injury. The users may then choose a hospital to travel to for diagnosis and/or treatment, wherein the app would provide contact information of the hospital.

This study, therefore, was proposed to create a mobile application that performs mainly two functions: The first function is to direct users to appropriate hospitals in Iloilo City for diagnosis and treatment based on symptoms of

the disease. By receiving user input of symptoms, this application would function similar to an online diagnostic sites symptom checker but will not require an internet connection. Users would then be given contact information of the recommended hospitals as well as their locations. The second function is to provide first aid information for common injuries. Users may select from a list of common injuries in which each one has a set of instructions to be displayed once selected.

The conduct of this research may initiate similar studies, specifically those with further improvement in design, in the future.

The conceptualized name of the app is HeroIn. It stems from the expression that the doctor, or hero, is in as to represent a patient being addressed by the doctor. Also, the reference of the app to the drug 'heroin' might attract attention from potential users.

**Methods.** – Figure 1 and Table 1 depict the activities and the process involved in data-gathering.

Activity	Predecessor	Duration (days)
A Gathering of Information	*	14
B Organizing of Information Gathered	A	2
C Designing of Application Structure	B	1
D Setting-Up of Web Database	*	5
E Input of Information into the Web Database	A, D	2
F Creating of Application Graphics (Assets)	B	5
G Creating of Back-End Program of the Application	C	14
H Adding of Web Database to the Back-End of the Mobile Application	G	2
I Creating and Adding of Application Graphics (Layout)	H	3
J Adding of Graphics (Assets) to the Mobile Application	F, I	2
K Testing the Online Functionality of the Mobile Application	J	1
L Testing the Offline Functionality of the Mobile Application	K	1

\*no predecessor

Table 1: List of activities to have been accomplished, along with time duration in days.

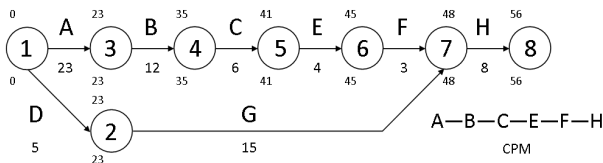


Fig. 1: PERT/CPM of the data gathering process.

*Gathering and organizing of information.* There were three different types of information that were gathered: 1.) common diseases and injuries, 2.) specialized clinics and hospitals, and 3.) first aid information.

First, information on common diseases along with their symptoms was gathered from the Philippine Department of Health’s public website. The scope does not include all diseases in existence, but rather some of them that frequently occur in the Philippines. The symptoms of the diseases were categorized into lists to incorporate in the application.

Then, the contact information of the hospitals was gathered from their online profiles. Supposedly, the information was to be gathered from the hospital institutions themselves along with their permission for it to be included in the application. This was to ensure that the information is updated and reliable. However, due to unresponsiveness from the institutions in communication, the information used was taken instead from the hospitals’ public websites.

Lastly, the first aid information was acquired from the website of the Philippine Red Cross - Iloilo Chapter, as well as from the website of the Department of Health. The information includes basic first aid dos and don’ts when handling common injuries.

*Designing of application structure.* Before the application could be programmed, its structure should be designed. The application structure should be designed based on the flow of events when using the application, as depicted in Figure 2.

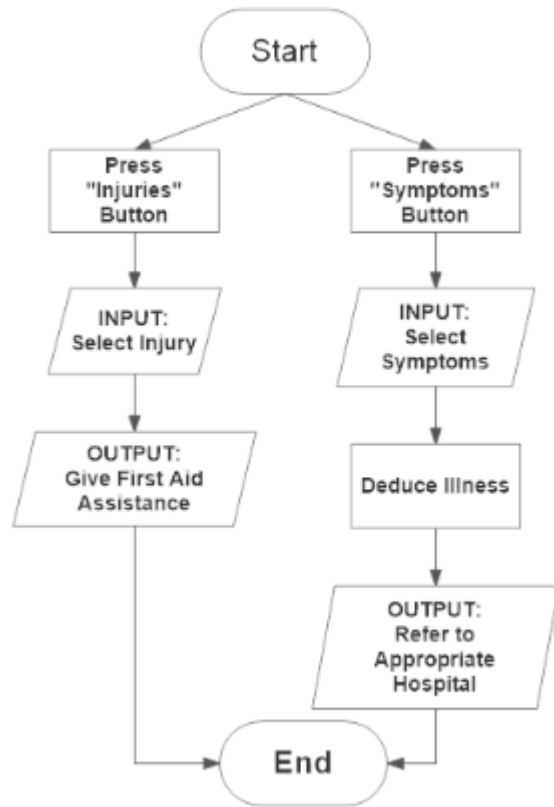


Fig. 2: Flow of events in the mobile application.

*Creating of back-end of program.* The functionality of the application was created using MIT App Inventor.

*Home Screen.* The home screen is the first screen the application shows after opening the application. It contains three buttons which will lead the user to either the symptoms screen, injuries screen, or about screen.

*Symptoms Screen.* The symptoms page contains a list of symptoms divided into two main categories: non-visual and visual symptoms. Users may check symptoms that they can identify then press the submit button. Doing this will take them to the hospital directory.

*Hospital Directory Screen.* The hospital directory displays a list of hospitals. The hospitals shown depend on the symptoms the user checked in the symptoms screen. Users may select a hospital then press the Hospital Details button which will lead them to the hospital details screen.

*Hospital Details Screen.* The hospital details screen provides contact information of the hospital previously selected by the user including phone number/s and email address.

*Injuries Screen.* The injuries screen displays a list of common injuries. Users may select an injury and press the Submit button in order to view first aid information for that injury.

*About Screen.* The about screen displays a short description of the application.

*Creating and adding of graphics.* The graphics were made using the software Microsoft Publisher 2010 and Photoshop CS6 Portable. The color scheme does not contain the color blue as it may cause eye strain due to its short wavelength and concentrated energy [4].

*Testing.* The functionality of the different parts of the application, such as the symptom checker, was tested. The hypothetical user would be provided a checklist for identifying symptoms of possible disease. Upon submission of the symptoms, the user would be shown a list of hospitals and, after a selection, the contact information. The user would also be provided an option to select an injury and be shown first aid information.

**Results.** – The Android application was coded using a personal laptop. It was coded and laid out using the online editor of MIT App Inventor. The application was tested through the use of personal laptops, through the use of emulators, and personal smartphones.

The graphics of the application were made using Microsoft Publisher and Photoshop CS6 Portable. The color scheme mostly consisted of different shades of green and yellow, and the texts in the application were all set to sans-serif.

The finalized application was capable of allowing the user to check the symptoms they are showing or experiencing. The application then uses the data acquired from to recommend appropriate hospitals that are capable of diagnosing the user based on their symptoms.

**Discussion.** – The application currently:

- allows users to identify their symptoms from a list of symptoms of common diseases
- suggests appropriate hospitals that could properly diagnose the user based on their identified symptoms

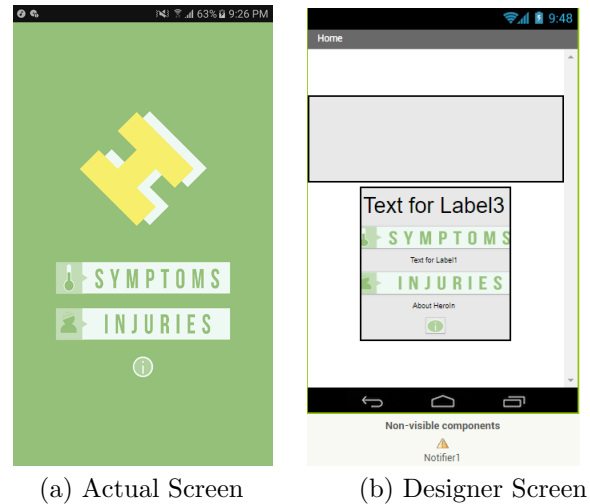


Fig. 3: Home Screen

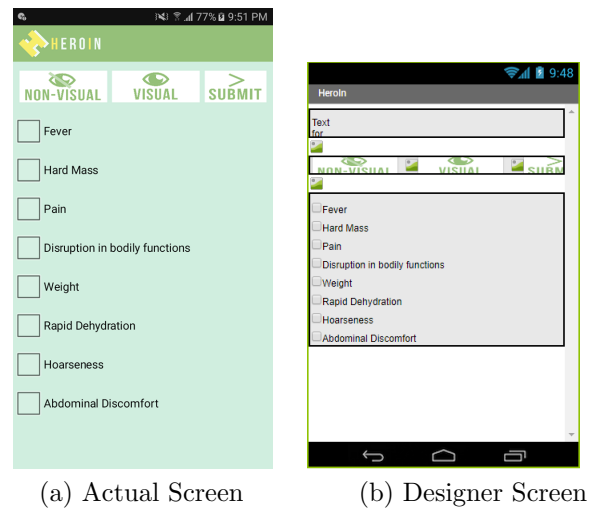


Fig. 4: Symptoms Screen

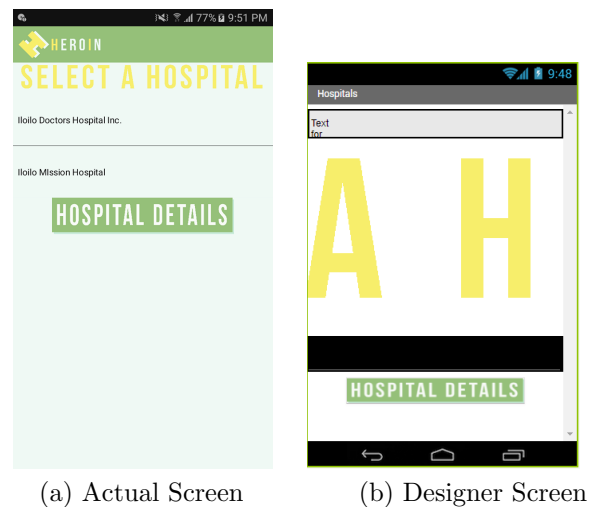


Fig. 5: List of Recommended Hospitals Screen

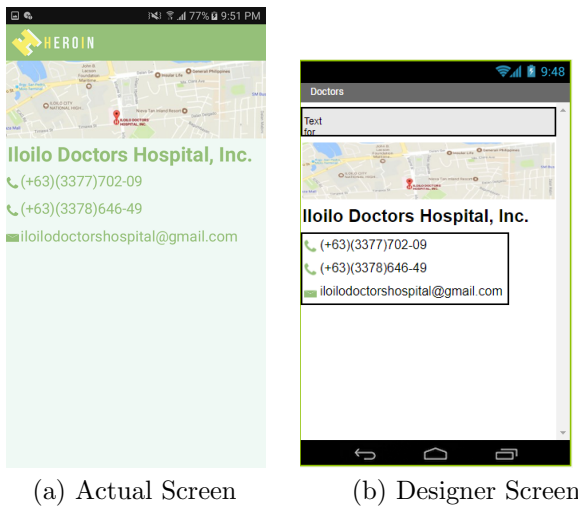


Fig. 6: Contact Information Screen

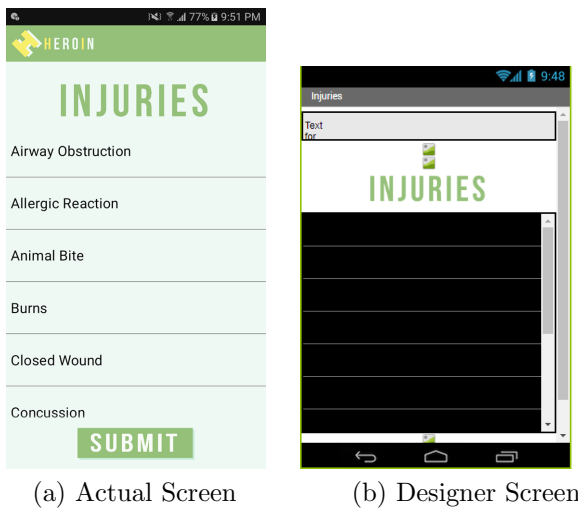


Fig. 7: Injuries Screen



Fig. 8: About Screen

- provides contact information and location of given hospitals
- and provides first aid information for common injuries

WebMD, a similar app, also has a symptom checker; however, unlike WebMD, HeroIn does not inform the user of the possible disease/s they have based on the symptoms because a proper diagnosis can only be given by a medical professional. HeroIn's hospital referral feature is similar to that of WebMDs with the main difference being the area where the hospitals are located. WebMD refers users to hospitals in the United States while HeroIn refers users to hospitals in Iloilo City. Finally, users are able to utilize all the features of HeroIn without an internet connection, which gives it an advantage over WebMD, an application that requires a stable internet connection whenever in use.

HeroIn	WebMD
Symptoms checker	Symptoms checker
Deduces illnesses	Diagnoses illnesses
Iloilo City	United States
No internet connection needed	Internet connection needed

Table 2: The features of HeroIn versus the features of WebMD.

**Summary.** – The application refers users to appropriate hospitals based on user-identified symptoms. Users can only identify their symptoms based on a list of symptoms of common diseases provided by the application. Users can also only select from a list of common injuries provided by the application, in which the application will display first-aid instructions for the selection.

**Conclusion.** – This application could allow users to use provided hospital contact information in order to be properly diagnosed at appropriate hospitals. It could also instruct dos and don'ts when performing first aid on injuries.

**Recommendations.** – Since the application was developed using App Inventor, its features are more limited than it could have been if it were developed using other Android application development software such as Android Studio. The coding style of App Inventor made it tedious to develop and organize because of its graphical style rather than the usual text-based style. A feature that could be added if a better software was used is one that would allow users to directly contact the hospital from the application. A more detailed 'about' page would also be an improvement. Some things that could be included

in the 'about' page are the scope and limitations of the application and disclaimers.

Another recommendation is to gather more reliable information. The information should be up to date and from a trustworthy source. In this study, the information incorporated into the application was merely from public online sites. A better action would be to directly consult institutions. This was not done in the study due to lack of time. Gathering contact information directly from the hospitals would provide users with contact methods that are more likely to result in a response from the hospital. Requesting of this information from the hospitals was attempted; however, none of the hospitals responded.

One more recommendation is to include more symptoms and hospitals in the application. This would broaden the scope of the application, thus benefiting more people.

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