

Mobile Application of Community Screening Test on Infant Fever (SToIF) using Backward Chaining Technique

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Abstract

The main purpose of this project is to develop a mobile application that able to provide guidelines to young parents to identify symptom of fever and the action by using backward chaining. Besides that, the aim of this project is to determine parents' satisfaction level towards "Mobile Application of Community Screening Test on Infant Fever (SToIF) Using Backward Chaining Technique" using questionnaire. This project application provides detection steps for infant fever by screening test technique. This application gives a focus on fever for infant below 6 months. Lack of experiences gives some ideas to build an application that help and provide guidelines on baby healthcare for young parents, especially when the parent have a new born baby always worry and keep thinking about well-being of their baby. The environment of the proposed system developed during the study is off-line system. Offline system is chosen because to reduce any problem related to efficiency of application. This application can be use even the user do not have any internet coverage. After searching and reading process of the information from journal, conference papers and books, comparison is made and backward chaining technique was chosen to be developed. Backward chaining is a technique which give more response time. The project provides an answer for each question. Screening test is a technique to screen the symptom of fever among infant.

1. Introduction

Mobile Application of Community Screening Test on Infant Fever (SToIF) Using Backward Chaining Technique is an application inspired by a new parent recently had such a wonderful baby. This application provides detection steps for infant fever by screening test technique. This application gives a focus on fever for infant below 6 months. Mobile Application of Community Screening Test on Infant Fever (SToIF) Using Backward Chaining Technique also known as SToIF as a short form. SToIF is an interactive application where the user will interact and give feedback to the application. As refer to the title of project, backward chaining is one of Artificial Intelligent method used in SToIF.

Lack of experiences gives some ideas to build an application that help and provide guidelines on baby healthcare. Young parents, especially when the parent have a new born baby always worry and keep thinking about well-being of their baby. Even though many guides and advices refer to experience parents, but at certain critical time, an application is needed. Moreover, generation nowadays prefer to choose information on the internet because can receive the information faster. This is because when it is involve the health and illness symptoms, quick action needed to prevent the illness become more serious and dangerous. Since internet became widely available in 1995, the use of it has increased quickly. Parenting professionals, involving multiple disciplines have begun to utilize the opportunities afforded by online technology. The potential of online resources for parents is widely acknowledged (e.g., Long, 2004; Rothbaum, Martland, & Beswick Janssen, 2008). A recent review shows that the first studies on this subject were published in 1998 and the evaluated internet services since then reflected an pressure on parents of preschool children, mostly concerning health topics (Nieuwboer, Fukkink, & Hermanns, 2013). On this research project, the focus is in the same area with the m-health. To observe an undesirable restriction for the patient, which easier the user to observe the fever question at home. The parents can find the solution via mobile devices and networks. There are dozens of applications in healthcare field available on both App Store and Google Play for fever detection, fever guideline or fever aids. For example, Toddler fever, Kids Fever MD, Kids Fever of All ages, Fever Baby Care, Kid's Health, Rash with fever, Baby Fever Aid, fevers and symptoms and Fever Tracker Free. To highlight the objective of SToIF, this project want to develop a mobile application that able to provide guidelines to young parents to identify symptom of fever and the action by using backward chaining. Second objective is to determine parents' expectation and satisfaction level towards SToIF.

1.1 Scope of Project

a) An android application to identify appropriate action according to symptom of fever.

The environment of the proposed system developed during the study is off-line system. Offline system is chosen because to reduce any problem related to efficiency of application. This application can be use even the user do not have any internet coverage. Offline systems are needless of internet connection, and just act based on the capabilities and applications of the mobile phones. Capabilities such as voice call, SMS (including text, voice, and multimedia), games and different software (depending on the type and model of the mobile phones) (ahmadi, noroozi, & mohamadi, 2013).

b) Infant below 6 months.

The constraint of SToIF is only cover on fever of infant below 6 months. Also fever is an illness that not frequently happens for normal baby. Dozens of similar application appear in the internet such as in the App Store, Play Store and Google Play.

1.2 Project Significance

Based on research done using Scopus database, keyword of infant healthcare application showed 192 documents result. To make the search more specific, keyword infant fever application was used. As a result, 57 documents result was reached. Then date range was limited from year 2004 until 2013. Document result showed 36. By reading the journals, mostly the report introduced medical method and knowledge for fever solution. Fever among infant is not emphasis in this search result. There is still no application that provides guidelines for symptom of fever illness for babies below 6 months in fever in this search.

The project significances are:

1. To help young parents when have a situation of infant illness in fever. Lack of experiences among young parents will lead to the wrong doing and cause bad consequences to the baby such as high fever or death. Therefore, parents need SToIF to ensure the parent can handle well the situation when symptoms of fever occur on the baby. From the view of author Burdette, Trotman, and Cmar (2012) the ability to rapidly access trusted medical knowledge at the point of care that can really help all healthcare providers better treat the patients' infections.
2. To help society take the best decision on baby fever issue. Easier the society to bring the important information anywhere and share the benefit of SToIF with relatives and friends.
3. To build a healthy community. In tandem call from government in RMK10 (Rancangan Malaysia Ke-10), speech by Prime Minister of Malaysia Dato' Sri Mohd. Najib Bin Tun Abdul Razak, RAZAK (2010) a healthy society contributes to a dynamic and productive nation. It has been said that a healthy mind comes from a healthy body. This application reply to government call.

2. Literature Review

Information were collected by searching the related journals, books and conference papers from few database like IEEE Xplore, Sage Journals and ScienceDirect. Search engine used for information gathering are Scopus, Yahoo, Google, PubMed and Web of Science. Keyword used for search strategies are backward chaining, forward chaining, screening test, parenting application, parent concern, fuzzy logic, application in healthcare, fever aids, Google Play, symptom of fever, types of fever, baby fever android application, mobile application, offline system, definition of fever, definition of Mobile Web, native apps, hybrid apps, android and eclipse.

2.1 Screening Test

The goal of factor screening is to find the really important inputs (factors) among the many inputs that may be changed in a realistic simulation experiment (W., C., & Z., 2014). In Karachi Pakistan, a research paper about Tuberculosis written by Creswell et al. (2014) showed by using more sensitive and specific screening and diagnostic tests such as chest x-ray and Xpert MTB/RIF may improve results assessed the approaches' ability to diagnose patients earlier in patients disease progression. Screening offers people live longer and enjoy healthier lives. Screening test also essentially helps the patients in identifying diseases in people who do not yet have any symptoms. As refer to Feig and A. (2014) screening mammography by virtue of its ability to substantially reduce death rates from the most common type of malignancy among women and the second leading cause of their death from cancer represents one of the major medical achievements.

2.2 Fever

Fever, defined as a rectal temperature greater than 38.0 °C (100.4 °F), is the most common complaint for children and infants who are brought to emergency departments (EDs) (Wing, Dor, & McQuilkin, 2013).

Fever is a common complaint in infants and children, and represents 10.5% to 25% of pediatric emergency department (ED) visits. Although most fever children have self-limited viral infections, a small but not insignificant proportion (especially infants 3 months of age and younger) will have serious bacterial infection (SBI), including bacteremia, bacterial meningitis, urinary tract infection (UTI), pneumonia, septic arthritis, osteomyelitis, and enteritis (Arora, Mahajan, & Prashant, 2013).

All toxic-appearing infants and children and all fever infants less than 28 days of age should be hospitalized for parenteral antibiotic therapy. Febrile or known as related to fever, infants 28 to 90 days of age defined at low risk by specific clinical and laboratory criteria may be managed as outpatients if close follow-up is assured. Older children with fever less than 39.0 C without source need no laboratory tests or antibiotics. Children 3 to 36 months of age with fever of 39.0 C or more and whose white blood cells (WBC) count is 15,000/mm³ or more should have a blood culture and be treated with antibiotics pending culture results (Baraff et al., 1993). In Indonesia, research paper by Semba et al. (2008) diarrhea and fever are important risk factors for anemia among

young children living in urban slum communities in Indonesia.

2.3 Mobile Application

The popularity of smartphones has increased in recent years, proven by the doubling of the number of sold smartphones from 149 million units in 2010 to 297 million units in 2011. The market share of smartphones has also increased from 19% of total sold mobile phones to 31%. The popularity of smartphones is not only because of the telephony or SMS, but can also be offered both by low cost phones and offered feature phones. Installing, selecting, downloading, and running countless fancy applications or apps become the reason of increases in smartphone popularity (Huy & Thanh, 2013). According to Serrano, Hernantes, and Gallardo (2013) they describe whether it is a specific website or logic execution to deliver content specifically to mobile devices by using the term *mobile Web*. Mobile Web give better feel and touch because it gives the user of the interface control it. Mobile Web is better than responsive Web. According to Boulton (2014), put together a simple formula like fluid grids, media queries and flexible images to build a responsive Web. However there is still need to maintain different sites with mobile Web.

2.4 Type of Apps

2.4.1 Web-based

Web-based also known as web apps. Web apps refer to any program that is accessed over a network connection using HTTP. It means the program runs completely inside the browser. Basically, they work with devices that have a browser. The web apps can also work on mobile devices, on the condition that the web apps do not rely on specific browser features that are unavailable on most mobile devices (Serrano et al., 2013). The examples of web-based or web apps are Wikipedia and Google voice.

2.4.2 Native Apps

According to Huy and Thanh (2013) a native app is an app designed to run in the computer environment it is being run. The environments are machine language and OS. Native apps are written in compiled programming languages C and C++, which allow the developers interact closely with hardware as no programming languages can. Native apps are compiled to the machine code and executed by the platform directly. Native apps work without any support from CLR (Common Language Runtime) and virtual machine.

The advantages of using native apps are the native apps offer the reliable, fastest, and most responsive experience to users. Native apps can tap into the wider functionality of the device, such as the camera, compass, accelerometer, notifications.

2.4.3 Hybrid Apps

Hybrid apps are mobile Web application packed into a native app. They behave like a native app and have same capabilities as a native apps, but hybrid apps developed using the same tools used to develop Web applications. The tools to build hybrid apps are different from native apps. The tools included are HTML5, CSS, and JavaScript (Serrano et al., 2013).

2.5 Type of Artificial Intelligent Method and Example of Research Paper

2.5.1 Backward Chaining

According to Nawi and Rahim (2008) backward chaining is a way of utilizing a set of condition-action rules. The main advantage of this method is goal-driven behavior while proving clauses, based on “from goal to fact” tracking. Besides, in interactive case a system does not bore user with asking a lot of inappropriate questions that are hardly related to the hypothesis under the proof (Karkishchenko, 2008). The condition-action rules (**if condition then action**) used by backward chaining, is similar to the simple rule of if-then in C-programming (Nawi & Rahim, 2008).

2.5.2 Forward Chaining

Forward chaining is a method of tracking the process starts from the initial state (facts), then headed toward the conclusion (goal) (Windriyani, S.Kom, Wiharto, & Sari Widya Sihwi, 2013). In forward chaining, you first conduct a task analysis to identify each component of the stimulus-response chain. Then you use prompting and fading to teach the first component of the chain. Once the learner can engage in the first component behavior without prompts, you teach the second component behavior in conjunction with the first component. Once the learner can engage in the first two components of the chain of behaviors without prompts, you teach the third component in conjunction with the first two components. This process continues until the learner can engage in the entire chain of behaviors at the appropriate time without prompts (Miltenberger, 2002).

2.5.3 Fuzzy Logic

Obtained from fuzzy set theory, fuzzy logic is a form of multi-valued logic to deal with reasoning that is more or less rather than accurate. Fuzzy logic variables have value of not only 0 or 1 but may have the degree of truth. A truth statement can range between 0 and 1 and is not constrained to the two truth values of classic propositional logic. Through fuzzy logic, it is no void or null results. The results present between the paradigms of true and false

can be determined by fuzzy logic. Fuzzy logic was developed by Lotfi Zadeh (Semogan, Gerardo, III, Castro, & Cervantes, 2011).

2.6 Android

There is a wide range of smart mobile devices, three main operating systems dominate the market, namely Apple iOS, Google Android and RIM Blackberry (D’Orazio, Ariffin, & Choo, 2014). The rapid growth in technology of smartphones has led to a revival for mobile application services. The user can download the any provided app from App Store (iPhone) and Android Market (Google Android) which the user need to pay or free for these applications. This is the factor Android Market become the user and developer’s choice. For app developers, the App Store’s method acquires developed app need to be signed using a private encryption key (Well, Jengl, Leel, & Chen, 2012). Android application easier the developer to create any application because can use Java for designation and development (Saipullah, Anuar, Ismail, & Soo, 2012).Google also provides the Android Development Tools (ADT), a custom plugin for the Eclipse IDE. The Android APIs are composed of numerous packages (Serfass & Yoshigoe, 2014).

Table 2.6 is the summary of type of Artificial Intelligent method.

Table 2.6 Summary of Type of Artificial Intelligent Method

METHODS	ADVANTAGE	DISADVANTAGE
Backward Chaining	-goal-driven behavior while proving clauses, based on “from goal to fact” tracking (Karkishchenko 2008) - give more response time (Jia, Lu et al. 2009)	-provably finds fitter solutions sooner, i.e., it is a faster algorithm. (Poli, Langdon et al. 2006) - lower accuracy (Jia, Lu et al. 2009)
Forward chaining	-When more efficient training strategies, such as instructions or modeling, cannot be used with learners with limited intellectual abilities.(Miltenberger and G. 2002)	- Generating many facts not directly related to the problem under consideration (Lee and Yoo 1995)
Fuzzy Logic	-Their simplicity and accuracy and better than the standard Manadni fuzzy logic method (Su, Tsai et al. 2012)	-have multi-valued, accepting partly true and partly fake at the same time (Negnevsky 2002)

3. Methodology

3.1 Proposed techniques

Backward chaining technique was chosen which is a technique that give more response time (Jia et al., 2009). Screening test is a technique to screen the symptom of fever among infant. According to Negnevsky (2002) Backward chaining is a goal-driven reasoning which an expert system has a goal and the inference engine attempts to find the evident to prove it. If such a rule is found and it is IF (condition) part matches data in the database, then the rule is fired and the goal is proved. The goal of the system is fever. Research process is needed to ensure the project is not similar with another person’s project. Any similarity is called plagiarism. According to Anderson, Steneck, and H. (2011) plagiarism is the misrepresentation of another’s ideas or words as one’s own, without proper acknowledgement of the original source. Questionnaires will be deliver to the users once the system is complete and ready for testing and evaluation process. Response and feedback from user will give the result of data collection. Result analysis will return the answer for question about the symptom of infant fever. Table 3.1 is summary of research framework.

Table 3.1 Summary of Research Framework

Phase	Task	Activity	Expected Outcome
Gathering Information	Literature Search	-determine problem statement, objectives, scope and significance of project. -Find research papers, journals, books from IEEE Xplore and ScienceDirect database.	-overview of project about screening test of infant fever
	Literature Review	-Find and explain the information -Definition of term,method, technique -Find related application as reference. -select technique and method	-define technique and AI method -complete literature review -milestone
Data Collection	Collect infant symptom of fever and screening test steps	-do structured question refer medical book proved by BMA(British medical Association) -collect infant fever symptom -deliver questionnaire to user	-the answered question from doctor and the confirmation of data will be used in system design. -data analysis's result and response from user
System Design	Design and develop application	-coding using Java -Eclipse as android platform	-android application developed -User Interface design
Testing and Evaluation	Testing and Evaluation	-test the application with question and answer - evaluate and display result	-table of result -conclusion of system rate
	Complete the report	-complete the information for manual report	-full report of project

3.1.1 Phase 1: Gathering Information

To gather and combine the information, first thing to do is collecting lots of information, data and facts from various sources. Mostly for online sources, Database from IEEE Xplore, Scopus and ScienceDirect were referred for collecting and searching journals, research papers and conference papers. For offline source, information is gathered from books. Based on gathered information, literature research was produced. By comparing and doing some reading, technique was selected based on characteristic and suitable element to be developed in the project.

3.1.2 Phase 2: Data Collection

Data collection is a step of collecting data from variety sources. Data may be divided into two groups which are primary data and secondary data (Majid et al., 1996). In this process, project goes through both categories. Through interview for primary data, structured interview is done by prepare the questions for interviewee. Collecting information from different sources is for secondary data. Question, answer and steps for fever screening test will be process after development phase is done.

3.1.3 Phase 3: System Design

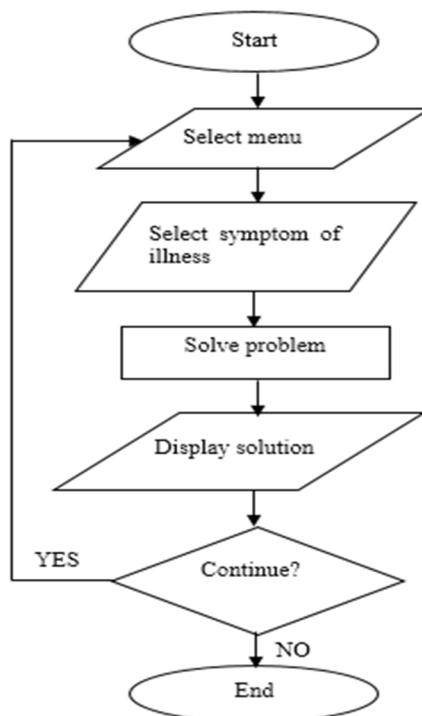


Figure 3.1 Application Logic Flow

Firstly, the system will display menu. Then user need to select the symptom according to the situation. After that, system come out with solution. The user will be asked want to continue or not. If yes, the system will display again the menu. If do not continue, system will out.

3.1.4 Phase 4: Testing and Evaluation

Testing and evaluation is the last phase. The system used by young parents with lack of experiences. The system will show the result of screening test.

4. Software and Hardware Requirement

a) Android SDK

The android SDK provide API libraries and developer tools to build, test and debug apps for Android. Provides the essential Android SDK components and a version of the Eclipse IDE with build-in ADT(Android Developer Tools) to streamline Android app development.(android, 2014)

b) Eclipse

An open source of IDE (integrated development environment) for Java projects. The platform which application software is created, Google officially supports Eclipse by provides ADT (Android Development Tools) plug-in for Eclipse.(android, 2014)

c) Windows 7

Operating system to handle activity of system development.

5. Expected Results

The expected result is the application able to provide guidelines to young parents to identify symptom of fever and the action by using backward chaining. It also hopefully achieve parents' expectation and satisfaction level towards SToIF.

6. Conclusion

SToIF of this project is about health of our generation. Concern and alert parents issued healthcare as an important thing. We hope that by developed this kind of apps, can gives any benefit to people out there. By trusting android as relevant platform, hopefully people can easily get access to this apps.

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