

# Development of Expert System for Cataract Self Screening in Android Mobile Platform Based in Pamekasan City: Case Study

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## Abstract

Cataract is one of the biggest causes of blindness in Indonesia. More than 3,0% of the population in Indonesia is becoming blind and still increasing. There are so many people who still don't realize that they are suffering from cataracts because of lack of access to a nearby eye clinic or hospital with an ophthalmologist. In this research, an application in mobile platform android has been developed to help people to screen by themselves and give a recommendation of ophthalmologists near them for checkup. An expert had made a decision about weighted in the symptoms and diagnosis in the system using the certainty factor method. The results show the kind of cataract and its weight that was suffered by users and give recommendations to nearby eye clinics.

Keywords: Cataract; blindness; expert; certainty factors; android

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## 1. Introduction

Cataract is one of the biggest causes of blindness in Indonesia. More than 3,0% of the population in Indonesia is getting to blind and still increasing each year [1]. Blindness due to untreated cataract in Indonesia is pointed at 0.78% of the population and a survey in 2014 reported that cataract prevalence is 1.8% [2]. East java is the highest prevalence with 4.4% of population and is followed by West Nusa Tenggara with 4.0%.

There are so many people who still don't realize that they are suffering from cataract because of lack of access due to a nearby eye clinic or hospital with an ophthalmologist and illiteracy are making the incidence of blindness rise each year despite the current medical resource and skilled ophthalmologist are available. It affects their life and socioeconomics because patients spread in the age group of 50-65 years which is the working class in Indonesia. They have a family, children who still need them for their economic life.

Information systems and technology are changing rapidly. One of the commonly used platforms is android mobile platform. In Indonesia, there are more than 200 million active users [3]. There are many applications that are based on the android platform used for people's daily activities like riding services, playing games, food deliveries, education, lifestyle and health services that have been available in the smartphone. The users have been spread from sabang until merauke and making data transactional traffic increase so fast.

Based on the problem and sociocultural conditions, through the use of android platforms in health service, a mobile android platform developed in this paper to help the people doing it for the first time when the symptoms of cataracts sorely in their eyes. the users can screen themselves about symptoms that happened

in themselves without any borders in anywhere and anytime. The application will give a result about the kind of cataract and its weight and recommend a nearby eye clinic or hospital with ophthalmologists.

## 2. Background

### 2.1. Cataract

Every five seconds one person in the world goes blind. It is estimated that over seven million people become blind every year. Blindness due to untreated cataract in Indonesia is pointed at 0,78% of population, and in the national survey 2014 it was reported that cataract prevalence was 1.8%, highest in SouthEast Asia. Based on data from 15 provinces in Indonesia, the prevalence of blindness in the population aged over 50 years is 3.0%. while blindness in East Java is 4.4%. It affects the quality of life and socio-economic status of patients.

A cataract is a clouding of the normally clear lens of the eye [4]. Most cataracts develop slowly and don't disturb your eyesight early on. But with time, cataracts will interfere with your vision. It develops when aging or injury changes the tissue that makes up the eye's lens. Some inherited genetic disorders that cause other health problems can increase risk of cataract.

The position of the lens is inferred by the cataract behind the colored part of your eyes (iris). The lens focuses light that passes into the eye, producing clear, sharp images on the retina which is the light-sensitive membrane in the eye that function like the film in camera.

### 2.2. Certainty Factor

The Certainty factor method was introduced by shortlife in the making of MYCIN in 1975[6]. It was first used for helping diagnosis in meningitis and blood infection. As well known any algorithm that works in uncertainty like fuzzy and bayesian, certainty factors need an expert system to determine the weight of symptoms. The equation of Certainty Factors is shown by equation 1.

$$CF = MB(H, E) - MD(H, E) \quad (1)$$

$$MB(H|E) = \begin{cases} 1 & \text{if } P(H) = 1 \\ \frac{\max[P(H|E), P(H)] - P(H)}{1 - P(H)} & \text{otherwise} \end{cases} \quad (2)$$

$$MD(H|E) = \begin{cases} 1 & \text{if } P(H) = 0 \\ \frac{\min[P(H|E), P(H)] - P(H)}{-P(H)} & \text{otherwise} \end{cases} \quad (3)$$

Where:

- CF = Certainty Factors value;
- H = Hypothesis
- E = Evidence
- MB = measure of increased belief

MD = measure of increased disbelief

P(H) = Probability of hypothesis

P(H|E) = Probability that H is true because of E

In this research, the measure of increased disbelief is ignored. The system will evaluate all possibility for the symptoms in order the result produce every diagnosis with their weight. The final equation in the system is shown by Equation 4.

$$CF[h,e1^e2] = CF[h,e1] + CF[h,e2] \cdot (1 - CF[h,e1]) \quad (4)$$

where:

CF[h,e1^e2] = paralyzed certainty factor

CF[h,e1] = measure of belief to hypothesis, if only if the value of first evidence given.

CF[h,e2] = measure of belief to hypothesis, if only if the value of second evidence given.

### 2.3. Android Mobile Platform

Android is operating system that was continuous improvement from linux kernel and still open source [7]. Android was developed to everybody like developers, designers and programmers. Android was unveiled in November 2007 and launched as commercial product was sponsored by Google in September 2008.

There are so many various electronic devices that is running on android operating system like smartphones, smartwatch, smartTV and Tablet. In this research, the author will focus on android smartphone platform. Minimum requirement that can use the application is Android 5.0 version.

## 3. Method

### 3.1. Determine Weight of Symptoms By The Expert

In this research, the author used the certainty factors method that must be valued by the expert. The expert will give a value from -1.0 until 1.0 on every symptom referred to kind of cataracts. It considered the cases that were met from the patients.

### 3.2. Design Phase of Application

This step focuses on the various stages in the development system like: preparing software architecture, detailing procedure of algorithm and building interfaces of applications.

### 3.3. Coding

This step is translating the design of applications into programming languages including tables of data, functions and procedures in order to be used in physical applications.

### 3.4. Testing

This step focused on blackbox testing. Blackbox testing made sure that all functions of the application were doing well.

### 3.5. Maintenance

This step is encouraged when the application is working properly. This step includes improvement and adding of feature application and development of the system.

## 4. Result and Discussion

The results of this research are shown in Figure 1 to Figure 3. Figure 1 is a first page that is shown a main menu like screening katarak, jadwal dokter, apotek, laboratorium, klinik and edukasi.

Screening katarak is a menu that is used for self-screening when you feel symptoms of cataract. Jadwal dokter is used for displaying all of the doctors in the database that were registered to the system. The Apotek menu is used for displaying all of the apotek lists in the system that were registered to the system. The Laboratorium menu is used for displaying all of the laboratorium lists in the system that were registered to the system. The klinik menu is used for displaying all of the klinik lists in the system that were registered to the system. And the last education menu used for displaying microblog that has been written in the system.



Figure 1. Display a Main Menu of applications

Figure 2 displays a form menu that must be filled with users data for screening. Name is filled with the user's name. Usia is filled by the user's age. Alamat is filled by the user's address. Gejala is filled with the user's symptoms. After all input text are filled then push button 'cari tahu'.

**Form Screening**

Nama  
Achmad

Usia  
25

Alamat  
Nugroho

Gejala

Mata Kiri Mengalami Gangguan

Usia Sudah Lebih Dari 50 Tahun

Lensa Keruh

Cari Tahu

Klinik Pro

Figure 2. Form Screening for user

**KlinikPro**

**HASIL SCREENING**

Halo, Ahmad

Hasil Screening kamu adalah sebagai berikut:

Katarak:

Katarak Snillis:

Katarak Subkaliprasis Posterior:

Katarak Traumatik:

Tidak Perlu Takut Untuk Datang Periksa, Ayo Periksa matamu sedini mungkin karena penglihatan adalah anugerah Tuhan yang patut kita jaga

Segera Periksa Ke Klinik/Rumah Sakit berikut:  
RSU Mohammad Noer pada Jam 07.00-12.00 Hari  
Senin hingga Jum'at

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Figure 3Page for Display Result of Self-Screening

Figure 3 displays a result screening and recommendations for users that have been screened. This will give users a brief information before they decide to go to the clinics or hospitals.

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