HUMAN DISEASES DIAGNOSIS SYSTEM(HDDS)

AIDA RAIHANA BTE ABD WAHAB

A thesis submitted in fulfillment of the
requirements for the award of the degree of
Bachelor of Computer Science(Software
Engineering)

Faculty of Systems Computer & Software Engineering
University Malaysia Pahang

JUNE , 2012

TABLE OF CONTENTS

ix

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 01

INTRODUCTION

1.1   Project Background

For this system, there will be five diseases that will be recognized. There are Bird (Avian) Flu, Chikungunya, H1N1, and dengue. The flu and the common cold are both respiratory illnesses but they are caused by different viruses. Because these two types of illness have similar symptoms, it can be difficult to tell the differences between them are based on symptoms alone. In general, the flu is worse than the common cold, and symptoms such as fever, body aches, extreme tiredness, and dry cough are more common and intense. Colds are usually milder than the flu. People with colds are more likely to have a runny or stuffy nose. Colds generally do not result in serious health problems, such as pneumonia, bacterial infections, or hospitalizations. For some people, they cannot differentiate if they got common fever or maybe one of the diseases that have been mention above.

Bird Flu or Avian Influenza

Avian influenza, or "bird flu", is an infectious disease of animals that caused by viruses that normally infects only birds and pigs. This disease can be infected by direct contact with infected poultry, or surfaces and objects that have been contaminated by their faces, this presently considered the main route of human infection. Most human cases have occurred in rural or urban areas where many households keep small poultry flocks, which often roam freely, sometimes entering homes or sharing outdoor areas where children play. This virus will be easily infecting other people.

Bird Flu symptoms

Bird flu in humans causes symptoms that are like human flu, such as fever, cough, sore throat and muscle aches, conjunctivitis, pneumonia and other severe respiratory diseases.

Complications of Bird flu

Bird flu in humans can also cause some serious and potentially fatal complications, including:

1. Eye infections
2. Pneumonia, including viral pneumonia
3. Acute respiratory distress
4. Inflammation of the brain and heart.

Chikungunya

Chikungunya fever is a viral disease that transmitted to humans by the bite of infected mosquitoes. The term 'chikungunya' means 'that which bends up' in the Kimakonde language of Mozambique. Chikungunya virus is a member of the genus Alphavirus, in the family Togaviridae. Chikungunya fever is diagnosed based on symptoms, physical findings, laboratory testing, and the possibility of exposure to infected mosquitoes.

What causes Chikungunya Fever?

Chikungunya disease is a viral disease transmitted in humans by the bite of infected mosquitoes. Aedes aegypti mosquito (also called yellow fever mosquito) is the primary transmission agent of Chikungunya Virus. This is usually found in tropics and hence the reason why Chikungunya is often seen in asian countries. For some cases, another mosquito species named Aedes albopictus is found to be a carrier. Aedes aegypti bites during day time and hence day time mosquito bite is the main reason for transmission.

2

Chikungunya Symptoms

Chikungunya typically starts with one or more of the following symptoms - chills, fever, vomiting, nausea, head ache and joint pain. The attack is sudden and sometimes it is accompanied with rashes. Severe joint pain is the main and the most problematic symptom of Chikungunya.

H1N1

H1N1 can be infected by the spreading of this virus that has been thought to be happening in the same way that the seasonal flu spreads. Flu viruses are spread mainly from person to person through coughing or sneezing by people with influenza. Sometimes people may become infected by touching something with flu viruses on it and then touching their mouth or nose.

H1N1 symptoms.

The symptoms of H1N1 flu are similar to the symptoms of seasonal flu and include fever, cough, sore throat, runny or stuffy nose, body aches, headache, chills, and fatigue. A significant number of people who have been infected with this virus have reported diarrhea and vomiting.

Dengue

Dengue fever (pronounced Den-gay) is a viral infection caused by the female mosquito (Aedes aegypti and Aedes albopictus). Dengue fever occurs in tropical and sub-tropical regions and usually increases in the hot and humid months. Dengue fever is not a new disease. It was discovered several hundred years ago. In recent years, dengue fever has become a major international public health concern.

How is Dengue fever transmitted?

Dengue viruses are transmitted to humans (host) through the bites of the female striped Aedes aegypti mosquito (vector). A mosquito bite can cause the disease. Incubation period occurs when the viruses has been transmitted to the human host. The period ranges from 3 to 15 days (usually lasting for 5-8 days) before the characteristics of dengue appear. During incubation time, the dengue viruses will multiply and increase.

The signs and symptoms of Dengue fever are as follows:

   I. High fever (104 F, 40°C)
  II. Chills
 III. Headache
 IV. Red eyes, pain in the eyes
  V. Enlarged lymph nodes
 VI. Deep muscle and joint pains (during first hours of illness)
VII. Loss of appetite
VIII. Nausea and vomiting
 IX. Low blood pressure and heart rate
  X. Extreme fatigue

1.2 Problem Statement

1. People are difficult to identify some diseases symptom.
2. The expertises are not available for 24 hour.

1.3 Objective

1. To study ruled based for human diseases diagnosis system.
2. To develop the prototype of human disease based on expert system by employing ruled based.
   .

4

1.4   Scope

1. Human diseases diagnosis system concentrated on 4 diseases which are bird flu (Avian Influenza) , dengue , Chikungunya and H1N1.

   .

CHAPTER 02

LITERATURE REVIEW

2.1   Introduction

In this chapter will explain briefly about the diseases and also the techniques that will be used in developing the system.

2.2   Background of the diseases

2.2.1   Dengue

The origins of the word dengue are not clear, but one theory is that it is derived from the Swahili phrase "Ka-dinga pepo", meaning "cramp-like seizure caused by an evil spirit". The Swahili word "dinga" may possibly have its origin in the Spanish word "dengue" meaning careful, which would describe the step of a person suffering the bone pain of dengue fever. Alternatively, the use of the Spanish word may derive from the similar-sounding Swahili. Slaves in the West Indies who contracted dengue were said to have the posture and pace of a great, and the disease was known as "Dandy Fever".

The first record of a case of probable dengue fever is in a Chinese medical encyclopedia from the Jin Dynasty (265–420 AD) which referred to a "water poison" associated with flying insects. The first recognized Dengue epidemics occurred almost simultaneously in Asia, Africa, and North America in the 1780s, shortly after the identification and naming of the disease in 1779. The first confirmed case report dates from

1789 and is by Benjamin Rush, who coined the term "breakbone fever" because of the symptoms of muscle pain and arthralgia.

The viral etiology and the transmission by mosquitoes were only deciphered in the 20th century. The socioeconomic impact of World War II resulted in increased spread globally. There are several factors that contribute to the increasing of dengue fever case such as :

- Unplanned urban overpopulation of areas leading to inadequate housing and public health systems (water, sewerage and waste management).
- Poor vector control, e.g., stagnant pools of water for mosquito breeding.
- Climate change and viral evolution (increased virus transmission has been linked to El Nino conditions.
- Increased international travel (recreational, business or military) to endemic areas.

2.2.1.1. Dengue Fever Chronology

Dengue fever, also called dengue, is a potentially serious disease caused by a virus. There are four types of dengue virus that can cause illness in humans. Dengue viruses are transmitted between humans by the bite of an infected Aedes mosquito.

Dengue is common and a serious public health threat in warm sub-tropical and tropical areas of the world. These include areas of Central and South America, Africa, Southeast Asia, China, India, the Middle East, Australia, the Caribbean and the South and Central Pacific. Dengue fever is most common in urban areas and outbreaks occur commonly during the rainy season when mosquitoes breed heavily in standing water. The incidence of dengue fever is on the

rise worldwide, and in some areas of Asia, complications of the disease are a leading cause of serious illness and death in children.

Mosquitoes pick up a dengue virus when they bite a human who is already infected with the virus. The mosquito then carries it in its own blood and spreads it when it bites other humans.

After a dengue virus enters the human bloodstream, it spreads throughout the body. Symptoms appear in about eight to ten days after a bite from an infected mosquito. Most people can recover from dengue fever, but some cases can progress into a life-threatening complication called dengue hemorrhagic fever. Symptoms of this disease include severe, uncontrolled hemorrhage and shock. Symptoms of the dengue might have a slight different which based on the ages of the patients. (Guzmán & Gustavo, 2004)

Making a diagnosis of dengue fever begins with taking a thorough personal and family medical history, including symptoms, and completing a physical examination. Recent travel to sub-tropical or tropical areas of the world is an important clue that may increase the suspicion of a diagnosis of dengue fever. Diagnostic testing includes blood tests that check for a dengue virus or for antibodies that are produced by the body to fight a dengue virus.

A diagnosis of dengue fever can easily be missed or delayed in areas of the world. There is no definite treatment for or vaccine to prevent dengue fever. Treatment of dengue fever includes getting plenty of rest, increasing fluid intake, and taking acetaminophen (Tylenol) for fever and body ache.

2.2.2 Influenza A (H1N1)

2.2.2.1 H1N1 History

The 1918 Spanish flu was caused by an avian strain of influenza A subtype H1N1. It is thought to have infected approximately one third of the world population, killing millions. In contrast to most influenza epidemics, it affected mostly healthy adults rather than the young, the old and the ill. This is thought to be the result of the body overreacting to the virus, a phenomenon called a cytokene storm. Healthy adults with strong immune systems had stronger reactions to the virus than populations normally affected by influenza. ("1918 flu pandemic") Cytokene storms are also related to SARS and avian flu (H5N1,) and may be implicated in the 2009 H1N1 pandemic. ("Cytokene storm")

A further H1N1 epidemic occurred in the Soviet Union in 1977-78. In this instance the virus affected mostly people under the age of 23, probably because there had been a similar strain present from 1947-1957 and people alive during that time would have developed some immunity. Influenza A/USSR/90/77 was incorporated into the 1978-79 influenza vaccine. ("Influenza A virus subtype H1N1").

Swine Influenza also known as H1N1 flu, Swine flu, Pig and Hog flu is a respiratory disease that caused by virus commonly found in pigs throughout the world. Most commonly it is due to H1N1 influenza subtype but sometimes H1N2, H3N1, and H3N2 can also be responsible. The major difference is that the current virus has strains of bird and pig viruses in it, and humans have very low or minor immunity to it. That is what has made it more likely to become a pandemic virus which can cause a global outbreak as it could easily spread from human to human. Swine flu can look like a normal fever as its symptoms are similar to normal human influenza like cold and cough, sore throat, body aches, headaches, chills and fatigue. If the diseases have been diagnosed earlier, treatment can be done to avoid further complications.

Swine influenza virus is very common in pigs worldwide. Approximately 1-4 percent of pigs gets infected and dies from it. The main mode of spread among

pigs either direct or indirect contact. In many parts of the world pigs are vaccinated against it.

2.2.2.2. H1N1 Types

The Influenza viruses causing sickness in humans are classified into three types - A, B and C. Type A is most common in pigs and C is rare. Influenza B has not been reported in pigs.

Swine influenza is commonly of the H1N1 influenza subtype, but sometimes they can come from other types, such as H1N2, H3N1, and H3N2.The recent outbreak of swine flu in humans is of the H1N1 type which is not as dangerous as some other types. It is caused by a new virus that has changed in ways that allow it to spread from person to person and it's happening among people who haven't had any contact with pigs.

Normally swine flu viruses do not transmit from pigs to human and do not cause swine flu, although if it happens, antibodies are produced in human blood. To distinguish from viruses that infects pigs and the seasonal influenza A H1N1 viruses that have been in circulation for many years, The World Health organization (WHO)calls it "pandemic (H1N1) 2009." The CDC calls H1N1 illness "H1N1 flu".

Its official name or scientific name is H1N1 influenza A. The H means hemagglutinin and the N means neuraminidase and the 1s refer to their antibody type. Influenza A is a genus of the Orthomyxoviridae family of viruses, and refers to the fact that the virus is first identified in an animal, usually a pig or a bird. When put together, they describe the 2009-2010 swine flu viruses.

2.2.3 Chikungunya

History of Chikungunya Disease

Chikungunya spreading rapidly in tropical area as it have been said in a journal, "ChikV was recently responsible for a massive reemerging outbreak in a large tropical area (East Africa and Indian Ocean in 2006, India, Thailand and Indonesia in 2007) and a limited epidemic in Italy in 2007." (Krejbich-Trotot, et al., 2011). Chikungunya(pronounced as chiki-en-GUN-yah) disease was first detected in 1952 in africa at a place called Makonde Plateau. This is a border area between Tanzania and Mozambique. The name "chikungunya" is from the Makonde language and its meaning is "that which bends up". This is a reference to the Chikungunya symptom where patients walk in a stooped posture due to joint pain. Chikungunya is also known as Chicken guinea, Chicken gunaya and Chickengunya. The similarity to the word "Chicken" has also lead to a lot of misconceptions about the disease.

There were two medical reports published in 1955 which identified and described Chikungunya disease. "An epidemic of virus disease in Southern Province, Tanganyika Territory, in 1952-53. II. General description and epidemiology" by W.H.R. Lumsden and "An epidemic of virus disease in Southern Province, Tanganyika Territory, in 1952-53. I. Clinical features." by M. Robinson looked at the infections at Makonde Plateau. In these papers, authors note the similarity of Chikungunya to Dengue fever.

Since 1952, Chikungunya showed cyclical outbreaks. Most number of Chikungunya cases was reported between 1960 and 1982 in Africa and Asia. The disease was not reported for a long time and it reappeared in 1999. From 2003 onwards frequent outbreaks were reported especially in south India. Following is a short summary of reported outbreak of Chikungunya worldwide.

2.2.3.1 Causes

Chikungunya disease is a viral disease transmitted in humans by the bite of infected mosquitoes. Aedes Aegypti mosquito (also called yellow fever mosquito) is

11

the primary transmission agent for Chikungunya Virus (CHIKV). This is usually found in tropics and hence the reason why Chikungunya is predominantly seen in Asian countries. In recent cases, another mosquito species named Aedes Albopictus is found to be a carrier. Aedes aegypti bites during day time and hence day time mosquito bite is the main reason for transmission.

Over years Aedes mosquito has evolved and has adapted itself for effective biting of humans! They even reduce humming of wings while approaching humans. They attack from below so there is minimal detection. This mosquito was usually seen in urban areas, but recently it has spread to many rural areas also. Aedes mosquito needs only 2ml of water for breeding and their eggs can lay dormant upto 1 year. Carrier mosquitoes can even pass the infection to its next generation.

The virus that contribute is a heat sensitive RNA virus (family is Togaviridae and genus is Alphavirus - Group IV+). There are three major groups of these viruses namely West African, central African and Asian.

Chikungunya virus requires an agent for transmission and hence direct human to human transmission is not possible. So far no such incidence is reported. Usually transmission occurs when a mosquito bites an infected person and then later bites a non infected person. Chikungunya also affects monkeys and it is also suspected that they are a major reservoir for the virus in Africa.

2.2.4 Bird Flu (Avian Influenza)

It stated that bird flu in human cases was found through in Asia, which is in Cambodia, Indonesia, Thailand and Vietnam in 2005. (Thomas Gstraunthaler, 2008). Avian influenza is caused by viruses. "Avian influenza is an infection caused by avian (bird) influenza (flu) virus. These influenza viruses occur naturally among birds."(Kumar, 2010) However, avian influenza is very contagious among birds and

12

can make some domesticated birds, including chickens, ducks, and turkeys, very sick and kill them.

Infected birds shed influenza virus in their saliva, nasal secretions, and feces. Susceptible birds become infected when they have contact with contaminated secretions or excretions or with surfaces that are contaminated with secretions or excretions from infected birds. Domesticated birds may become infected with avian influenza virus through direct contact with infected waterfowl or other infected poultry, or through contact with surfaces (such as dirt or cages) or materials (such as water or feed) that have been contaminated with the virus.

Infection with avian influenza viruses in domestic poultry causes two main forms of disease that are distinguished by low and high extremes of virulence. The "low pathogenic" form may go undetected and usually causes only mild symptoms (such as ruffled feathers and a drop in egg production). However, the highly pathogenic form spreads more rapidly through flocks of poultry. This form may cause disease that affects multiple internal organs and has a mortality rate that can reach 90-100% often within 48 hours.

2.2.4.1 Causes

16 HA (haemagluttinin) and 9 NA (neuraminidase) are the subtypes of influenza viruses are known to infect wild waterfowl, thus providing an extensive reservoir of influenza viruses perpetually circulating in bird populations. In wild birds, routine testing will nearly always find some influenza viruses. The vast majority of these viruses cause no harm.

To date, all outbreaks of the highly pathogenic form of avian influenza have been caused by viruses of the H5 and H7 subtypes. Highly pathogenic viruses possess a tell-tale genetic "trade mark" or signature – a distinctive set of basic

amino acids in the cleavage site of the HA – that distinguishes them from all other avian influenza viruses and is associated with their exceptional virulence.

Not all virus strains of the H5 and H7 subtypes are highly pathogenic, but most are thought to have the potential to become so. Recent research has shown that H5 and H7 viruses of low pathogenicity can increased the pathogenic after circulation for sometimes short periods in a poultry population and mutate into highly pathogenic viruses. Considerable circumstantial evidence has long suggested that wild waterfowl introduce avian influenza viruses, in their low pathogenic form, to poultry flocks, but do not carry or directly spread highly pathogenic viruses. This role however, have changed very recently, at least some species of migratory waterfowl are now thought to be carrying the H5N1 virus in its highly pathogenic form and introducing it to new geographical areas located along their flight routes.

Apart from being highly contagious among poultry, avian influenza viruses are readily transmitted from farm to farm by the movement of live birds, people (especially when shoes and other clothing are contaminated), and contaminated vehicles, equipment, feed, and cages. Highly pathogenic viruses can survive for long periods in the environment, especially when temperatures are low. For example, the highly pathogenic H5N1 virus can survive in bird faces for at least 35 days at low temperature (4oC). At a much higher temperature (37oC), H5N1 viruses have been shown to survive, in fecal samples, for six days.

For highly pathogenic disease, the most important control measures are rapid culling of all infected or exposed birds, proper disposal of carcasses, the quarantining and rigorous disinfection of farms, and the implementation of strict sanitary, or "biosecurity", measures. Restrictions on the movement of live poultry, both within and between countries, are another important control measure. The logistics of recommended control measures are most straightforward when applied to large commercial farms, where birds are housed indoors, usually under strictly controlled sanitary conditions, in large numbers. Control is far more difficult under

poultry production systems in which most birds are raised in small backyard flocks scattered throughout rural or semi urban areas.

Besides from being difficult to control, outbreaks in backyard flocks are associated with a heightened risk of human exposure and infection. These birds usually roam freely as they scavenge for food and often mingle with wild birds or share water sources with them. Such situations create abundant opportunities for human exposure to the virus, especially when birds enter households or are brought into households during adverse weather, or when they share areas where children play or sleep. Poverty can make the problem worse in situations where a prime source of food and income cannot be wasted; households frequently consume poultry when deaths or signs of illness appear in flocks. This practice carries a high risk of exposure to the virus during slaughtering, butchering, and preparation of poultry meat for cooking, but has proved difficult to change. Moreover, as deaths of birds in backyard flocks are common, especially under adverse weather conditions, owners may not interpret deaths or signs of illness in a flock as a signal of avian influenza and a reason to alert the authorities. This tendency may help explain why outbreaks in some rural areas have smoldered undetected for months. The frequent absence of compensation to farmers for destroyed birds further works against the spontaneous reporting of outbreaks and may encourage owners to hide their birds during culling operations.

2.3 Artificial Intelligence

2.3.1 Definition

The phrase Artificial Intelligence, which was coined by John McCarthy three decades ago, evades a concise and formal definition to date. One representative definition is pivoted around the comparison of intelligence of computing machines with human beings. Another definition is concerned with the

performance of machines which "historically have been judged to lie within the domain of intelligence". None of these definitions or the like has been universally accepted, perhaps because of their references to the word "intelligence", which at present is an abstract and immeasurable quantity.

A better definition of artificial intelligence, therefore, calls for formalization of the term "intelligence". Psychologist and Cognitive theorists are of the opinion that intelligence helps in identifying the right piece of knowledge at the appropriate instances of decision making. The phrase "artificial intelligence" thus c bane defined as the simulation of human intelligence on a machine, so in simple words it is giving the machine efficient to identify and use the right piece of "Knowledge" at a given step of solving a problem. A system capable of planning and executing the right task at the right time is generally called rational.

Further, a system can act rationally only after acquiring adequate knowledge from the real world. So, perception that stands for building up of knowledge from real world information is a prerequisite feature for rational actions. A machine without learning capability cannot possess perception. The rational action of an agent (actor), thus, calls for possession of all the elementary characteristics of intelligence. Relating artificial intelligence with the computational models capable of thinking and acting rationally, therefore, has a pragmatic significance.

There are for techniques in AI :
1. Rule based Expert System
2. Fuzzy Logic
3. Neural Network
4. Genetic Algorithm