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**BIOMEDICAL ENGINEERING**

Covid-19 has causes a serious pandemic across the world, with serious impacts been felt in all areas of humanities. As a young engineer working with a multi-national health company, you are saddle with a huge responsibility of designing web-based application that can detect, display, rate (degree of infection), store, transmit data obtained wirelessly and access the data via the web together with other features which the boards of directors allow you to come up with.

1. Design the application following the software development cycle.
2. Critically discuss the hardware and software features.
3. Support your answer with a flowchart and an algorithm.
4. Draw the Top-down or Bottom-up design approach of the application.

ANSWER

**CONCEPTUALIZATION**

Corona virus (COVID-19) which has become a global phenomenon started in the city of Hubei – Wuhan China in November 2019. The virus continued to spread like wide fire across the globe and it got to a point that it was declared as global pandemic by the World Health Organization (WHO). The virus has affected over 1.6m and claimed over 100,000 lives globally.

There is currently no known vaccine or medication for COVID-19. As young Engineers, we felt compelled to see how we can contribute to at least the management of the virus. Hence, the concept for BS-V (Biosensor-virus) detector. BS-V (Biosensor-virus) detector is a web based health care management application which can detect, display the rate of infection, transmit and also store data wirelessly. It can also monitor one’s health conditions and also keep update about their health.

**SPECIFICATION**

In designing this application, we adopted a platform-independent web based system for easy of usage. The security and privacy of users were also considered, since the application is a web-based solution, this will prevent the user’s profiles from being compromised. The application is a self-service solution that enable users take their vital signs (weight, temperature, blood pressure etc.). The application will analyze the vital signs taken and generate a report which the user will be able to view as a feedback.

**Hardware specifications**: Compatible hardware devices for a particular operating system or application were tested. The various aspects of hardware requirements include: i3 as the processor of the operating system, the sensor, the Intel dual core, internet connection for the health center, clinical thermometer.

**Software specifications**: these are the required programs and other data/information or computer instructions that are needed for the application to work optimally to achieve the desired result. These include:

* Biometric identification: uses optical scanners, which can help keep track of those individuals, as well as those who have been vaccinated once a vaccine is developed and released. In the process of the biometric identification, the skin structure on the fingertip is being scanned to help determine their vital signs.
* Data management: allows medical practitioners to add and store patient information electronically and allows physicians to view it.
* Video recording and Two-way video connection: allows patients to describe their body status, their triggers and what happened afterwards and also allow patients to see the doctors they communicate with.
* E-prescribing: allows medical practitioners to send prescriptions directly to pharmacies electronically. It sends accurate and understandable prescriptions, considerably improving the quality of patient care.
* Patient history: stores the history of the patients with existing problems such as allergies, current medications and so on.

**Design**

A well-defined algorithm for a BS-V detector

STEPS

1. Start
2. Input biometrics
3. Body status to the virus=0
4. Add COVID-19 symptoms in the system
5. Input the software involved
6. Create a questionnaire
7. Collect qualitative data
8. Analyze data
9. IF, body status positive to the virus
10. Biometrics identification blinks
11. Else
12. Biometrics identification doesn’t blink
13. Display Feedback
14. Stop

Flowchart

Start

Body Status=0

Input COVID-19 symptoms on the system to detect the virus

Create a healthcare questionnaire

Qualitative data is collected

Takes medications and leave

Do you have the virus?

NO YES

Daily records are kept

Treatment commences

Is quarantined

Stop

**Implementation**

From the above design specifications, we implement a prototype which consists of:

1. Web server with Apache,
2. Application server with Tomcat
3. Database server with PostgreSQL
4. Web application with JAVA technologies

**Testing and Debugging**

The BV-S detector app needs to be error free which is why testing and debugging the app and their functionalities becomes so important. Testing can also be done with different operating systems, internet connections and hardware.

**Release and Update**

This application is being released to detect, display the rate of virus, store, transmit and access data through the web together and its update when necessary based on the health center feedback.

**Top-down design approach of the application**

Data viewer function

Data Analyst

Feedback function

Create questionnaire

JavasScript, HTML documents

Database server

Application server

Web server

BS-V detector application