AFE BABALOLA UNIVERSITY ADO-EKITI, EKITI STATE

Structured Computer Programming
(ENG 224)

COVID-19 Web Application Software (COVIDr)

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Introduction

COVID-19 is the most recently discovered member of the coronavirus family. Coronaviruses are a large family of viruses which may cause illness in animals or humans. In humans, several coronaviruses are known to cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). This new virus and disease were unknown before the outbreak began almost out of nowhere in Wuhan, China, in December 2019.

People can catch COVID-19 from others who have the virus. The disease can spread from person to person through small droplets from the nose or mouth which are spread when a person with COVID-19 coughs or exhales. These droplets land on objects and surfaces around the person. Other people then catch the virus by touching these objects or surfaces, then touching their eyes, nose or mouth. People can also catch COVID-19 if they breathe in droplets from an infected person who coughs out or exhales droplets. This is why it is important to stay more than 1 meter (3 feet) away from a person who is sick.

Conceptualisation

The major problem and biggest fear that is accompanied by the deadly virus is the ease which it spreads. At the time of writing this paper, there have been a staggering 1,475,976 cases confirmed globally. Doctors, nurses and all other medical workers around the world are working around the clock to ensure that the situation does not escalate to incontrollable proportions. This has places substantial pressure on medical personnel, hospitals and medical equipment and resources to combat the virus. Thus, we must face a truth that **not everyone needs to be or can be tested for COVID-19**. Most people have mild illness and are able to recover at home. Everyone being on edge necessitates a certain degree of organisation and order to which people get medical attention.

This causes us to place our reliance in computer science once again to make our lives easier and more importantly keep us safe and healthy. **COVIDr** is the solution to these problems. COVIDr is a web-based application that is intended to collect patient data and determine who gets tested and treated.

COVIDr is designed to perform the following functions:

- Ascertaining if an individual could be positive for the virus (by watching out for the major infection markers such as difficulty in breathing, fatigue, Persistent pain or pressure in the chest, etc.)

- Determining his\her possible level of infection by ranking the severity of the aforementioned symptoms
  NOTE: It does this by the individual answering a series of detailed, patient-unique questions (based on genetic predisposition, sex, etc). The app asks questions provided by well-trained doctors and experienced virologists and then processes the responses given by the patient and determines if he\she could be positive and then it;
- Contacting the appropriate health bodies to contain such patients, conduct further tests and give them the medical attention they require.

  By doing this, there is a considerable reduction in the pressure in hospitals because only patients that show symptoms caused by the virus are attended to. These patients with high probability of infection are taken to the hospital where they submit respiratory samples obtained by various methods, including nasopharyngeal swab or sputum sample. Results are generally available within a few hours to 2 days which will also be uploaded to a server database where the patient can see. All this patient data including personal details, residence, age, blood type, genetic traits, symptoms, tolerance to certain medication, also degree of infection are all transmitted wirelessly from the patient's mobile phone and hospital devices through mobile networks to the database where it is stored. This application also ranks patients by severity of symptoms and degree of infection and places the elderly under high priority so they are given speedy and near-immediate attention as they at higher risk of death to the virus. This makes it user-friendly and allows for complete ease of access as the internet has become a ubiquitous part of our daily lives and is available to even inhabitants of third world countries where there are minimal medical facilities. It also serves as a source of statistical data that can be accessed at any time by the World Health Organisation and other medical bodies and most importantly, it will dramatically improve the rate of survival of patients through efficient classification of patients.

  Other functions include:

- To the individual;
  - Providing information on the virus and preventive measures one can take
  - Keeps you updated on the pandemic i.e giving alerts on new cases around you

- To the hospital;
  - Providing patient data and other medical records
  - Giving a list of high-priority patients based on age and severity of symptoms
  - Serves as an interface to upload patient data, number of mortalities, number of discharged patients, degree of infection of each patient, etc

- To the government and health organisations;
  - Providing statistical data such as number of cases, rate of spread, number of deaths, number of discharged patients, survival rate, etc
  - Map graphs of rate of spread
  - Serves as a storage of data

Specification

1.) User Registration

a. Personal data input
- Full name
- Phone number
- Home Address
- Upload Identification document (e.g National ID, National Password)
- Passport picture upload

b. E-mail address input field
c. Password input field
d. Accept Terms & Conditions checkbox
e. Submit button
f. Save user to database

2.) Login

a. Phone number / E-mail address input field
b. Password input field
c. Login button
d. Load user from database
e. Log user into system

3.) Logout

a. Logout Button
b. Clear session
c. Prevent account theft

4.) Dashboard

a. Main home page
b. New users should redirect here
   - Upload medical data (sex, genotype, blood type, genetic diseases, disabilities, medical history)
   - Notification settings (request to receive COVID-19 news and updates)
c. Existing users should redirect here after login
   - Request for COVID-19 test (where users take the COVID-19 symptoms survey)
   - Learn about COVID-19
   - How to prevent infection
   - Around you (gives notifications on new cases, etc and displays cases in your immediate surroundings, country or the world)
   - Contact emergency hotline
   - Donate to combat the pandemic
   - Update profile

Design

Application Logo of COVIDr.

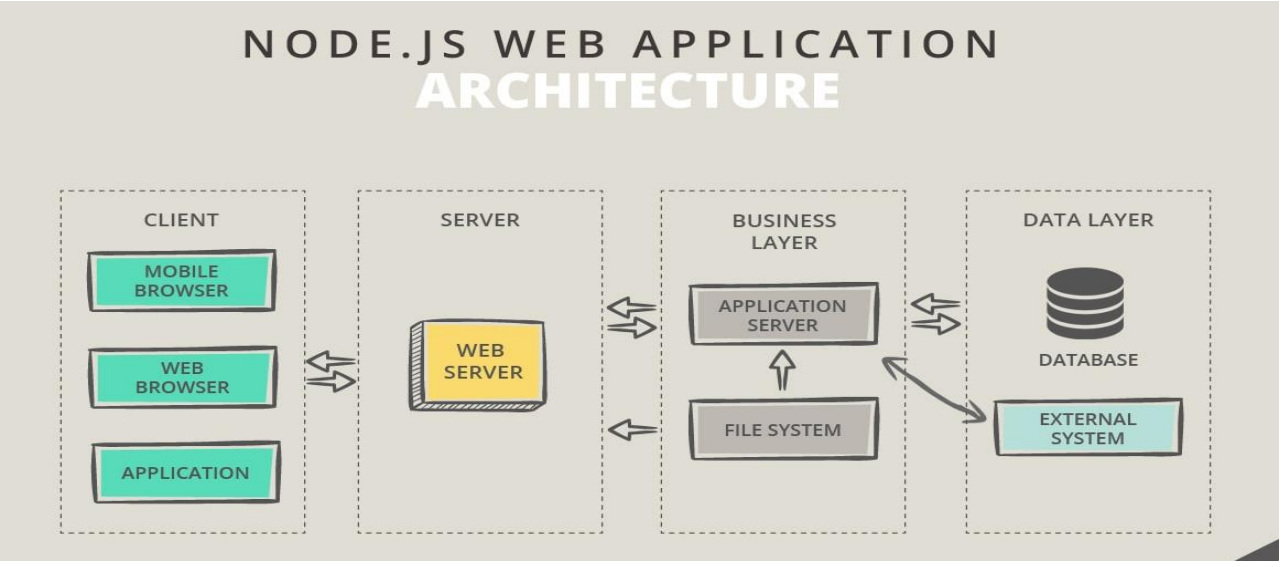
Responsive Layout with PC and Mobile Support

Colour Scheme: Black/Grey/Red (PC) and Grey/Black (Mobile)

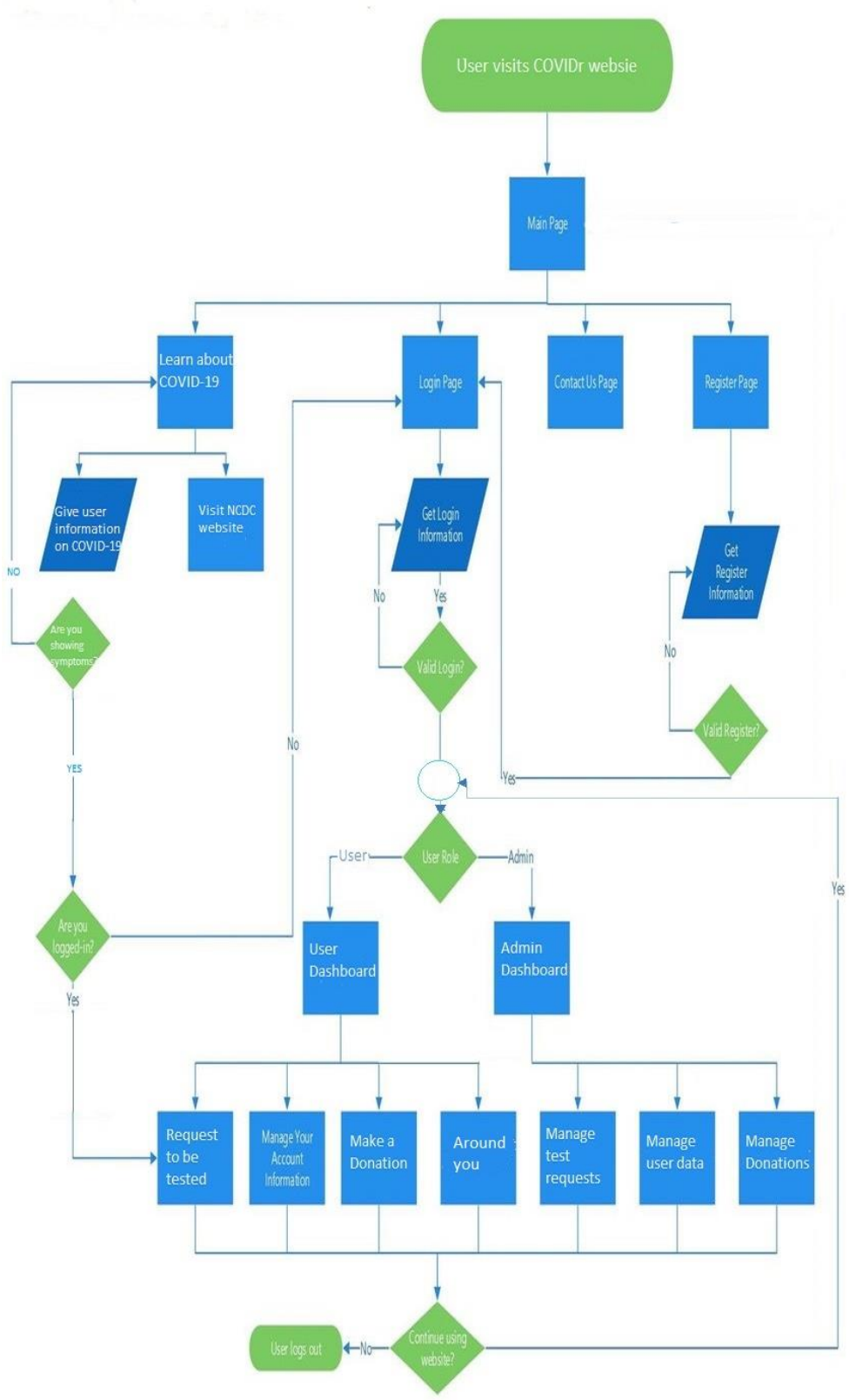
Layout: Supports PC, Mobile and Tablet

Framework: Node.js

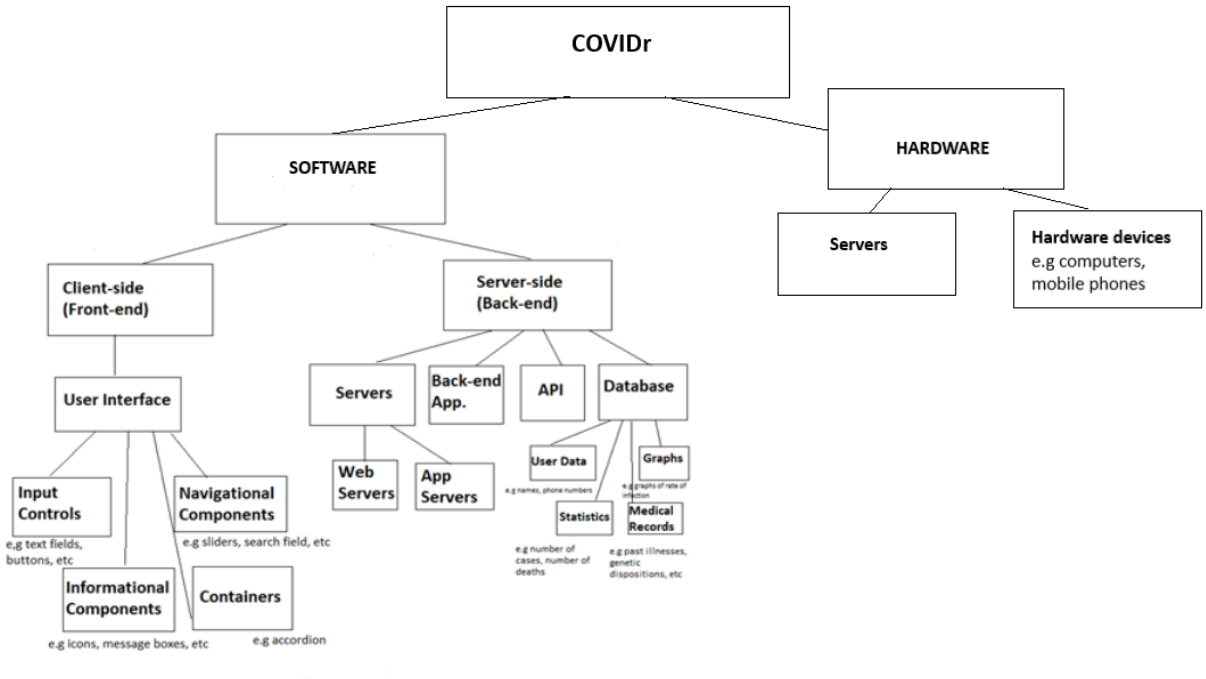
Architecture:



Flowchart:


User visits COVIDr websie
Main Page
Learn about COVID-19
Login Page
Contact Us Page
Register Page
Give user information on COVID-19
Visit NCDC website
Get Login Information
Get Register Information
NO
No
Yes
No
Are you showing symptoms?
Valid Login?
Valid Register?
YES
No
Yes
User
User Role
Admin
Yes
Are you logged-in?
User Dashboard
Admin Dashboard
Yes
Request to be tested
Manage Your Account Information
Make a Donation
Around you
Manage test requests
Manage user data
Manage Donations
User logs out
No
Continue using website?

Top-Down Design:



Algorithm:

1. START,
2. USER LOGIN,
3. IF LOGIN IS SUCCESSFUL;

4. DISPLAY DASHBOARD (with options),

5. IF ("**MANAGE ACCOUNT**" IS SELECTED);

6.DISPLAY PROFILE DETAILS.

7. ELSE IF ("**MAKE DONATION**" IS SELECTED);

8.DISPLAY DONATION PAGE…

9. ELSE IF ("**AROUND YOU**" IS SELECTED);

10. DISPLAY STATISTICAL DATA (graphs of rate of infection, number of cases and deaths, etc in your location)

11. ELSE IF ("**REQUEST FOR TEST**" IS SELECTED);

12. ANSWER SURVEY,
13. DISPLAY RESULT

14. IF RESULT == POSITIVE;

15. PRINT “Your request has been processed and you are a candidate for COVID-19. Emergency services have been contacted and will shortly arrive at your address”

16. CONTACT NEAREST HOSPITAL

17. ELSE,

18. PRINT “Your request has been processed and there is a high possibility you are negative to the virus. For more info, visit our main page.”

19. STORE DATA

20. TRANSMIT TO MAIN DATABASE

21. ELSE IF (“**CONTACT US**” IS SELECTED);

22. DISPLAY “Send us an email at {e-mail address} or call us on {phone number}”

23. ELSE; (Unsuccessful login)

24. GO TO STEP 2

25. END

Implementation

1.) Physical Hardware

Supported Client Devices:

The COVIDr web app supports all types of mobile phones, tablets, laptops and desktops across all popular operating systems.

Server:

Supermicro 5018D-FN4T

Specifications;

- Intel Xeon D-1541 2.1 - 2.7 GHz 8-Core Processor; Aspeed AST2400 BMC
- Supports 4x 288-pin DDR4 DIMM. Supports up to 128GB DDR4 ECC RDIMM, Supports up to 64GB DDR4 ECC/non-ECC UDIMM, 2133/1866/1600MHz @ 1.2V, DIMM Sizes: 32GB, 16GB, 8GB, 4GB
- Supports 2x 3.5" drives or 4x 2.5" drives (requires optional bracket); Supports 1x M.2 (PCIe or SATA) M Key 2242/2280
- 2x 10GBase-T (Intel SoC), 2x 1GbE (Intel i350-AM2), 1x Dedicated IPMI (Realtek RTL8201N PHY)
- Case Dimensions: 437mm x 249mm x 43mm, 17.2" x 9.8" x 1.7" (in inches); Front I/O Access; Includes 200W Low Noise AC-DC power supply with RFC

2.) User Interface Design

The user interface will be designed used HTML, CSS and JavaScript on SublimeText

3.) Backend Design

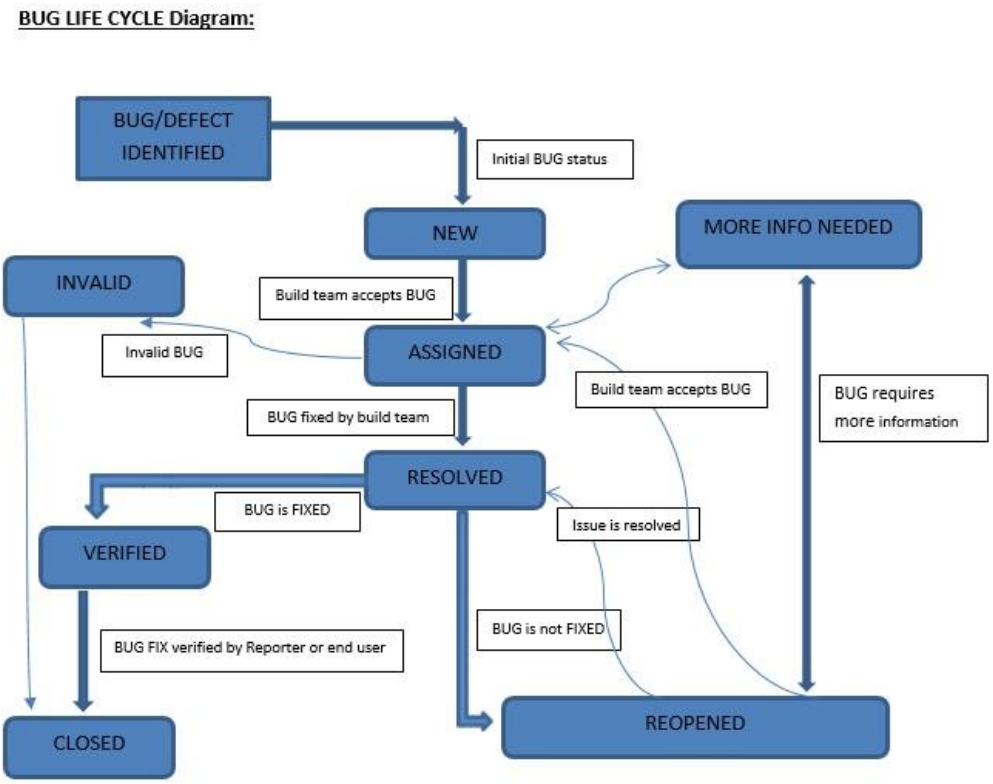
The backend will be coded using Python on Pycharm and the Database Management System (DBSM) will run on SQL with adequate security measures and restrictions put in place.

Covidoctor.com is the proposed domain name and will be purchased from namecheap.com. An SSL certificate will also be setup to ensure maximum encryption of data.

Testing and Debugging

After development and servers and databases have been set up and hosted locally, the app is then extensively tested for breaches in security and privacy, errors and bugs in code to ensure that all functionalities work as expected and validate that all requirements and specifications have been met.

All this will be done using the bug life cycle.



Release and Update

COVIDr is expected to be deployed and hosted on the proposed URL (http://covidoc.com) a month after the development starts.

It is intended to be maintained and monitored frequently. User complaints and issues will also be attended to and resolved with little delay.