

Contact Tracing Information System for Corona Virus

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ABSTRACT

This research work focuses on developing a corona virus contact tracing information system. All over the world, corona virus have become a pandemic that is changing the lifestyle of mankind. Health system is seriously threatened and is at the brick of collapse. No known cure for the virus for now and the much talked about vaccines are not 100% effective. Since the spread of the virus is through contact, there is need to keep track of the patients contacts within the last seven days. The method used so far is to ask the patients where and who he/she visited in the past days. Where the patient is un-conscious this system may not work. So the aim of this research work is to develop an integrated database that can keep record of people's daily contacts by capturing the location and names of people he/she met with their phone numbers. The system creates a platform for reporting and monitoring contact tracing information, vaccinated, recoveries and casualties. These designs are simulated using a web-system developed with PHP, MySQL and JavaScript. The System Design followed the OOADM methodology for componentization of the system Modules giving room for coupling, decoupling, modification, encapsulation and reuse, as well as easy maintainability. The result obtained from the new system developed shows a high level of contact tracing information as compare to existing system.

Keywords: Virus, Corona, Contact Tracing, Information System

I. INTRODUCTION

On March eleven, 2020, the World Health Organization (WHO) declared COVID-19 a virulent disease and therefore the effects of COVID-19 can determines the evolution of our

society for several years to come (WHO, 2020). The unfold of the COVID-19 can greatly rely upon the capability of our society to quickly converge toward mitigating the unfold and finding medical solutions. Until a vaccine is found, the simplest weapons within the hands of states are going to be hindrance and quick designation of infected folks.

To reduce the unfold of COVID-19, the event of contact tracing approaches is presently thought of united of the most weapons to confront the unfold of the virus worldwide. Indeed, contact tracing is taken into account by the United Nations agency as a key element of the infection watching by together with contact identification, listing, and follow-up aspects (Ferretti, 2020). So far, contact tracing has been chiefly supported manual procedures, within which infected folks area unit interviewed in an effort to trace their contacts. Then, the health authority reaches every contact to see if they gift any symptoms and advises them consequently, e.g., get tested and/or self-quarantine. This approach is long, resource tight, and at risk of errors, since folks won't keep in mind all their contacts or, notwithstanding they are doing, they may not recognize them in the flesh or a way to contact them.

WHO pointers for contact tracing state that "At least eightieth of latest cases ought to have their shut contacts derived and in quarantine among seventy two hours of case confirmation" (WHO, 2020). However, the United Nations agency doesn't cite peer-reviewed proof to support these pointers, and a few studies recommend that tracing must be a lot of thorough and prompt to be effective (Ferretti. 2020). The NigerianCenters for sickness management and hindrance (NCDC) additionally suggest contact tracing, however supply on the face of it conflicting recommendation within the face of

widespread transmission, once thousands of latest contacts might have to be derived daily.

To address these problems about quick unfold of COVID-19, digital contact tracing has emerged with completely different initiatives, that area unit presently driven by organizations and governments worldwide. the most purpose is to with efficiency discover those that are in shut contact with infected people, in order that they is promptly and properly suggested on successive steps to follow. This way, doubtless infected people is simply detected and self-isolated even before showing symptoms. Therefore, the infection chain is interrupted as early as attainable.

The invention of net and of the globe wide net offers nice opportunities of revolutionizing people's lives. Health care settings area unit increasing using info technology, that offers important contribution in providing care services by aiding info sharing, cut prices and rising quality of care (Blaya, 2010). In 2005, United Nations agency passed a resolution that permits member states to realize collaboration and provision of mutual support in health systems integration aiming in rising health care, supporting police work activities and sharing data (Blaya, 2010). With a lot of folks connected to the net, that is out there and reliable, this will be achieved. COVID-19 management programs that use mobile and web-enabled applications provide a good potential for considerably rising COVID-19 contact tracing, vaccination together with harnessing the advantages for the worldwide fight against COVID-19.

Contact tracing is considered effective strategy to spot recently infected people and has become an important element of the COVID-19 control strategy in most low and middle-income countries (Volkman, 2016). in touch tracing, each patient is asked to call his or her contacts in alternative terms graphing neighbors United Nations agency is also infected, then the general public health official seeks out these contacts as time and resources allow to screen or check whether or not they area unit infected and quarantine them if thus. COVID-19 contact tracing generally aims to spot people with COVID-19 virus among the contacts of a COVID-19 patient and providing adequate quarantine, treatment or follow-up, reducing morbidity and mortality thanks to COVID-19 among freshly infected people and reducing more transmissions. Contact screening enhances efforts of contact tracing. This method follows risk stratification regarding the infectiousness of the index patient, the length and

proximity of exposure, and therefore the condition of the contact.

In this analysis work, an internet primarily based corona virus contact tracing data system was developed. The analysis work designed a centralized info to gather info of patients that tested positive to COVID-19 virus, their shut contacts among the last seventy two hours of case confirmation, the fatalities and therefore the discharged patients. this can facilitate within the fight against COVID-19 virus, thereby limiting the unfold and eradicating the virus from the world.

1.1 Statement of the Problems

1. There is no record of people's daily contact.
2. There is no known platform for reporting and monitoring contact tracing information.

1.2 Objectives of the study

1. To develop an integrated database that can keep record of people's daily contacts by capturing the location and names of people he/she met with their phone numbers.
2. To create a platform for reporting and monitoring contact tracing information, vaccinated, recoveries and casualties.

II. REVIEW OF RELATED LITERATURE

In the review of related literatures, several contact tracing and screening systems are presented and analyzed focusing on the architecture and highlighting the similarities and differences. The limitations of these systems are also noted.

BlueTrace protocol was presented by (Bell, 2020). The approach follows a centralised solution in which users register their phone numbers in the backend service, which provides random IDs that are associated with such numbers. These IDs are used during smartphones' encounters. However, in case a user is infected, they will be authorised to share their encounter history with the health authority, which in turn can obtain the phone number of the infected person and the number of people who were in contact with them. Therefore, based on the BlueTrace design, the backend service is able to access users' personally identifiable information. Quantifying COVID-19 Transmission Suggests Epidemic Control with Digital Contact Tracing (Ferretti, 2020).

Corona Virus outbreak in Nigeria and Contact Tracing Issues

With the eruption of COVID-19 in 2019, public health education and risk communication campaigns on corona-virus commenced in earnest with the reportable patient of COVID-19. Each standard and social media, as well as WhatsApp, Twitter, and Facebook, have aided in diffusing updates on the virus (Akinmayowa, 2020). The NCDC provides regular updates on the eruption with support from major telecommunication operators within the country. To boot, there are sensitization activities across some streets within the country by the National Orientation Agency (NOA), non-governmental organizations (NGOs), faith-based organizations (FBOs), and alternative development partners. The NCDC often publishes pointers on the bar of coronavirus (social distancing, safe handwashing, maintenance of private and metastasis hygiene, etc.) additionally as a directory of helplines for every state.

Messages on the COVID-19 infection were equally translated into native languages to achieve the final Nigerian population. The NCDC uses a communication campaign with the theme, #Takeresponsibility, on social media for a Nigerian audience (NCDC, 2020). This can't be too emphasized the role of the individual each within the bar of COVID-19 and therefore the social maintenance of their health whereas the pandemic lasts. However, the extent to that public health education has influenced positive activity changes among Nigerians stay obscure. Many of us and faith-based organizations have continued to defy the directives on social distancing and public gatherings by organizing social events, whereas some worship centers additionally conducted congregational services. The govt. consequently adopted social control ways through the preparation of police, military, and paramilitary organizations. However, this development additionally generated several issues because of the brutality of some security officers (Kalu, 2020).

Experiences from the 2014 Ebola fever eruption and Lassa fever ought to have helped the country inure the COVID-19 eruption. The primary strategy once the patient was contact tracing. a number of the challenges to the implementation of the contact-tracing strategy embrace lack of support and cooperation from the returnees UN agency reportedly stuffed pretend contact addresses and incorrect phone numbers within the forms at the purpose of entry (NAN, 2020). Consequently, the first days' initial bottlenecks enclosed poor contact tracing and delayed closure of all entry points into the country.

Another important response was an imprisonment to forestall community transmission of COVID-19. There was a imprisonment in 2 states (Lagos and Ogun) and therefore the FCT for four weeks effective from March thirty, 2020, with restrictions on inter-state travels throughout the country (Muanya, 2020). Then a relaxed imprisonment began on night four, 2020, exchange the whole imprisonment with a curfew from eight pm to six am whereas the interstate travel ban was still in situ. Each the imprisonment and therefore the curfew exempted staff in essential services (health staff and security personnel) and people concerned within the movement of essential commodities (food and drugs). The lockdown/curfew was place in situ with the hope that folks would adhere to the essential safety pointers of social distancing, handwashing, and therefore the use of facemasks publically places. Federal Republic of Nigeria recorded a relative increase within the variety of COVID-19 cases throughout the relaxed imprisonment. From night eighteen (two weeks once the relaxed lockdown) to June seven (a total of twenty days), Federal Republic of Nigeria recorded half dozen, 527 positive cases, that represent a fifty two increase within the variety of all positive cases (NCDC, 2020). The relaxed imprisonment could be a precursor to the gradual reopening of the economy that might more cause a COVID-19 upsurge if hastily enforced.

Generally, the response to the coronavirus eruption in Federal Republic of Nigeria might be delineated as medico-centric and reactionary. The federal and state governments solely started isolation centers once positive cases were confirmed within the country. as an example, there was no molecular laboratory in Ogun State, wherever the patient was identified; the patient was transferred to port State for identification and treatment. an equivalent applies to alternative states (such as AkwaIbom, Oyo, Sokoto, and Abia), wherever the governments non-inheritable medical instrumentality to fight the eruption solely once positive cases had been reportable. The inadequate proactive readiness accounted for the initial panic wave created by COVID-19 in Federal Republic of Nigeria.

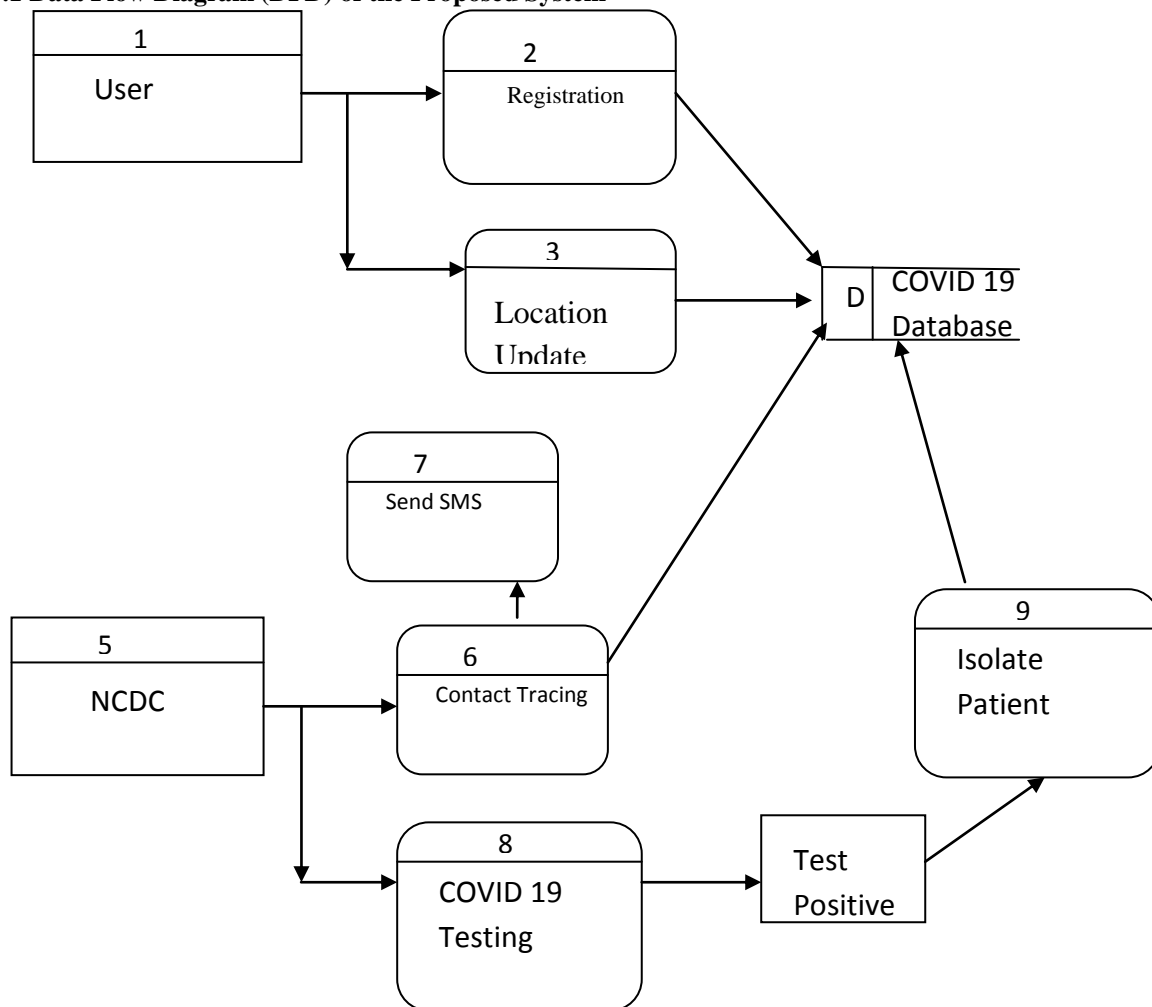
III. PROPOSED SYSTEM AND IMPLEMENTATION

The proposed development of corona virus contact tracing information system is designed to collect information about people's movement and contacts in terms of collecting data on the locations

visited more especially public places and also people he/she came in close contact with. The application is web based and allows users to register on the platform to have their details submitted to the server. The details collected will include their phone numbers, worship place, work / market place, school if any, and residential address. This information is submitted to the server and will require users to update the system with their movement locations every day. The process of COVID 19 contact tracing starts with the clinician indexing the contacts from information provided by patient or the locations he/she visited. Once a COVID 19 contact is indexed, he /she is notified through SMS to inform he/she that he/she had a contact with a COVID 19 patient so that he/she may be screened and further advised. All data collected is stored in a MySQL database. With the location/contact updates of the COVID 19 patient, it is easy to retrieve all other people that visited the

same location and through the database retrieve their details including residential address and phone number. Once the SMS is sent to them to come for screening, a follow up visit to their residential address will be necessary is the contact person refuse to come for screening. The system designed will keep track of the contact tracing on daily basis and generate reports on the outcome of the test conducted i.e. whether the patients' needs to be isolated for testing positive to COVID 19 or whether the person is discharged as a result of testing negative to COVID 19. Also the system developed keeps statistical report on total number of COVID 19 patients, total number discharged, total fatalities and also the total number of people tested. The system can also provide an analytical report of the COVID 19 patients across states, LGA, and overall totals.

3.1 Data Flow Diagram (DFD) of the Proposed System



3.2 Methodology Adopted

In this analysis work, Object-oriented analysis and design methodology (OOADM) was adopted and it's a collection of standards for system analysis and application design. It uses a proper organized approach to the analysis and style of data system. Object-oriented style (OOD) elaborates the analysis models to supply implementation specifications. the most distinction between object-oriented analysis and alternative kinds of analysis is that by the object-oriented approach we have a tendency to organize needs around objects, that integrate each behaviors (processes) and states (data) sculpturesque when planet objects that the system interacts with. In alternative or ancient analysis methodologies, the 2 aspects: processes and knowledge area unit thought-about one by one. The primary tasks in object-oriented analysis (OOA) are:

- i. Find the objects

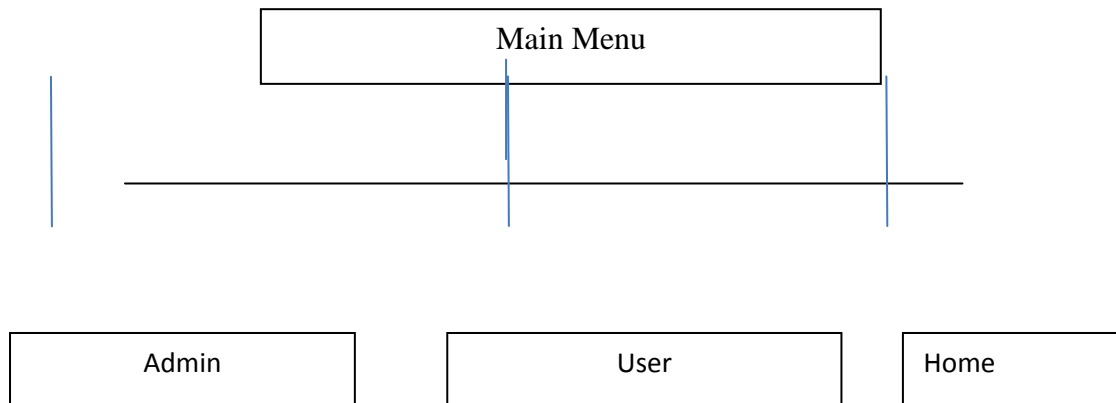
- ii. Organize the objects
- iii. Describe how the objects interact
- iv. Define the behavior of the objects
- v. Define the internals of the objects

Common models used in OOA are use cases and object models. Use cases describe scenarios for standard domain functions that the system must accomplish. Object models describe the names, class relations (e.g. Circle is a subclass of Shape), operations, and properties of the main objects.

3.3 System Implementation

The research developed an integrated database that can keep record of people's daily contacts by capturing the location and names of people he/she met with their phone numbers and also created a platform for reporting and monitoring contact tracing information, vaccinated, recoveries and casualties.

The main menu consists of these functional components.



The Submenus/Subsystems

As shown in the figure above, the major subsystems in the corona virus contact tracing information system are Admin, Users and Help. It was designed using Top-Down Approach. The system is structured in a way that each subsystem is accessed from the main menu and executed independently. The sub menus / sub systems are as follows:

The Admin Subsystem

The Admin subsystem as shown in figure above involves every admin level activity of the system, which is required to keep the system functional and up to date. It is only available to the designated NCDC officer. The modules in the subsystem includes: Contact Tracing, Test Result Entering, View corona virus Contacts, Manage

Notifications/Alerts/Messages, Statistical Reports, and update records.

The User Subsystem

The user Subsystem as shown in figure above involves the users signing on to the platform and updates their contacts and location any time they come in contact with anyone.

IV. CONCLUSION

The main goal of the research was to develop a corona virus contact tracing information system. Contact tracing approaches exist but these approaches are faced by significant challenges as discussed in this research. The incidence of corona virus all over the world will not decline in the absence of effective and organized contact tracing. The web-based system comes in handy to

positively impact COVID 19 control efforts specifically in contact tracing in Nigeria. Studied literature revealed that the current system used in Nigeria for contact tracing was paper based, although other countries have employed web-based systems, Android applications and geographical information systems. The challenges of COVID 19 contact tracing in African country were with success investigated. It absolutely was noted that the present system is moon-faced with challenges of low police work and observance of COVID 19 patients and their contacts, inadequate variety of physicians to hide thin geographical locations, and deficiencies in coordinating knowledge assortment and news. The assessment showed that the present system of contact tracing is paper-based beside MS- workplace applications for recording knowledge. The scientist conjointly additional studied the connected architectures, styles associated models of contact tracing and also the gaps known to produce an optimum resolution. The planned resolution could be a web-based contact tracing system. OOADM methodology was used to style, develop and test the application.

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