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SMART HEALTH CONSULTING ONLINE SYSTEM USING BLOCK CHAIN

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ABSTRACT:
During the Coronavirus (COVID-19) epidemic, telehealth has become quite popular. With the use of telehealth, doctors and other medical professionals may check in on patients and keep tabs on their symptoms from a distance. When it comes to offering services that are transparent, immutable, traceable, auditable, secure, and trustworthy, today's telehealth systems fall short. Furthermore, they are centralized and vulnerable to failure at a single location. We address these issues and more in this study by suggesting a private blockchain-based solution. We show how blockchain technology may improve three crucial telehealth services: teleconsultation, drng administration, and medical testing. Additionally, for telehealth transactions started by many players, our suggested system guarantees integrity, immutability, accountability, and non-repudiation. Cloud storage and decentralized storage systems like the Interplanetary File System (IPFS) are incorporated into our suggested solution for storing and tracking large-size digital material, such as photographs and audio/video recordings of healthcare service sessions. In order to facilitate the enforcement of limits on the blockchain, the registered participants are granted access rights according to their responsibilities. To ensure data integrity and provide trustworthy alerts and notifications, Smaitcontl actions are created. Details of the algorithms' implementation and testing are provided. We go over the solution's security features, compare them, and assess them.

INTRODUCTION

TheCoronavirns (COVID-19)outbreak hasbegun in late 2019. Itis confronting and challengingtheexistinghealthcai·e systems.Recently,manydoctorsliving in theU.S.felt theurgeto stepin dming theCOVID-19Indiancrisis [1]. This wasmadepossible through telehealth services and remote consultations.

Although telehealth isnotanew technology, the spread ofthe pandemic urgedthe healthcareindustry towork ai·ound the hurdlesand expedite its adoptionworld-wide[2].Telehealthhas provento be apractical,conve- nient, and beneficial tool inmany healthcai·e se1vices (e.g.,duringpregnancy andfor aiding diabeticandpsychiatric patients)

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[3]-[5]. Shifting from face-to-faceto remote and The associate editor coordinating the review of this manuscript and approving it for publication wasSedat Akleylek. vi1tual interactions can help to maintain ongoing care and treatment despitetravel restnctions and geographicbound- aries. The unprecedented challenges posed by the pandemic have led to redesign the healthcare model to triage and timely deliver se1vices while reducing the risk of contamination and transmission of COVID-19 [6]. Technology and expense are important factors that can play a major role in curbing and limiting the integration and interoperability of telehealth into the healthcare mode

LITERATURESURVEY

Perspective: What a difference a disaster makes: The telehealth revolution in the age of COVID- 19 pandemic

J. R. Maese, D. Seminara, Z. Shah, and A. Szerszen

Despite the existence of telemedicine since the late 1950s and early1960s,it took a pandemic to b1ing thistechnology mainstream. Thecritical urgency of the pandemic drove an ausp1c10us alignment of policy, economics, and technology to facilitate the widespread implementation of telehealth. It is imperative that this synchronicity bemaintained in the post-COVID era in order to optimize our health care system to be ready for the next threat to the health of the United States.

Telehealthlifestyleinte1ventions aregaining increasing popularityforuse mpregnancyformanagementof complications such as gestational diabetes! and for monitoring of blood pressure.2 Telehealth hasalsobeenused in trials in low-income and middle-income countries, particularly in rnral communities where access to antenatal careis challenging.3Theoption ofusing telehealth in antenatal care has been brought sharply into focus with the coronavirns disease 2019 (COVID-19) pandemic. Pregnant women are considered a vulnerable group and are therefore advised to be stI-ingent with public health measures such as social distancing and self-isolation to lower their risk of exposure to the virus. This advice has led to recommendations to limit face-to-face consultations and for rapid implementation of remote accessto antenatal care throughout the UK.4 The methods and outcomes of the GLOWrandomisedcontI·olledu·ialdone by Assiamira Fenara and colleagues5 and published in The Lancet Diabetes and Endocrinology are therefore are therefore of interest and are particularly relevant during the cunent COVID-19 pandemic.

EXISTINGSYSTEM:

This section describes the details of our system design. It explains thebreakdown of our solution and presents the sequence of events in the smait contI·acts and solidity code. Figure 1 shows the components of the proposed blockchain- based solution. The system depends on the doctors and the medical practitioners who aim to provide in-home tI·eatinent services remotely. The doctors rely on teleconferencing calls to seeandheai·thepatientsandassesstheir needs. Medical drugs are administeredasneededaswellasmedicalte stsare

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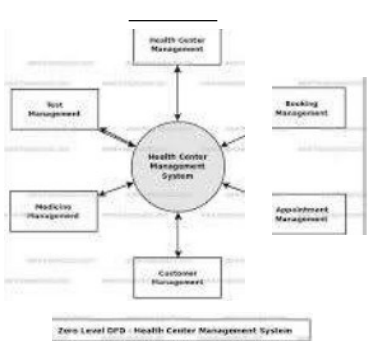
caiTied out when necessaiy. Courier servicesai·ealsousedtomaketreatment and testing possible. The video calls are all recorded and uploaded on a cloud storage or a decenh·al- ized storage platfo1m such as IPFS. The system is managed, tr·aced, and tr·acked through blockchain.The role of each part in the systemisalsoexplainedbelowinfurther detail.

PROPOSEDSYSTEM

We propose a blockchain-based decenh·alized solution for telehealth services,which doesnotdependonthird paitiesorcenh·alizedse1vers.•Weshow how to integrate our decenh·alized on-chain framework with off-chain storage systems such as cloud storage or a decenh·alized storage system as that of the Interplanetai·y File System (IPFS). Off-chain storage isused forstoring and keeping h'ack of large-size digital content such asvideo calls of telehealth sessions. • We develop four smait conh·acts along with six algo- rithms to register the pa1ticipating entities and offer the patients different telehealth servicesinamannerthatistr·anspai·ent, tr·aceable,auditable,private,secure,ai1d hustw01thy. • We implement and testthe developed smait conh'acts for three different telehealth services: teleconsultation, drug adminish·ation, and medical testing. We make the code publicly available on GitHub.l • Our proposed blockchain-based telehealth solution isgeneric enough tobeadapted into different use case scenarios with minimal effo1ts and modifications.

SYSTEMARCHITECTURE:



IMPLEMENTATION:

MODULES:

1) Admin: admin can login to application by using usemaine and password as 'admin' and 'admin'. After login admin will add doctorsand hospitaldetails andcanadddisease details medicineandsymptomsdetails.
2) Doctor: doctor can login to application by using usemame and password given by admin and then can view all appointments from patients and prescribe medicines
3) Patient: patients can signup with the application and then login and then seai·ch disease and its medicine details ai1d can take appointments and can view prescription from doctors.

To store data in Blockchain we need to design SMART CONTRACT which contains functions to store and retrieve details from Blockchain. We have designed following Conh·act for this project.

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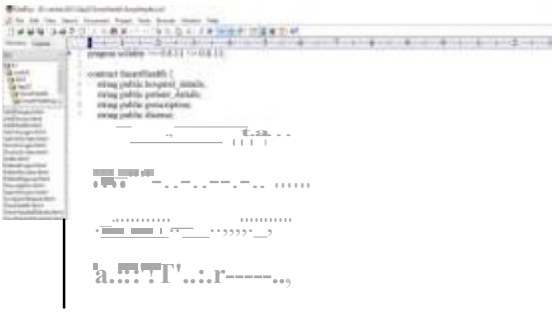

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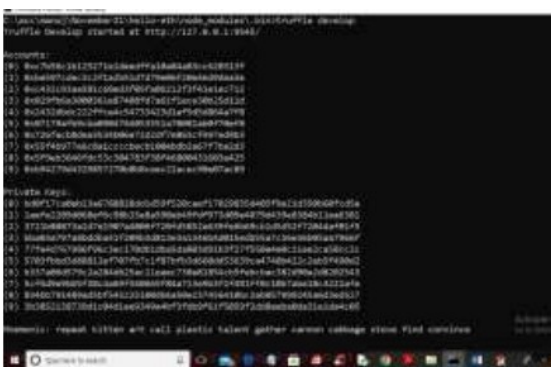
In above Smait Contract screen for different data storage we have defined different Blockchain functions and to deploy this contract on Blockchain Etheremn tool we need to follow below steps

Go inside 'hello-eth/node modules/bin' folderandthendoubleclickon 'rnnBlockchain.bat' file to stait Etheremntoolandgetbelowscreen



In above screen Ethereum generated some default account ai1d private keys and now type command as 'truffle migrate' and press enter key to deploy contrnct and get below contract address

In above screen in white colour text we cansee 'SmartHealth'contract deployed andwegotcontractaddress alsoandthis address we need to specify in python program to store and read data from Blockchain. In below screen showing python code calling Blockchain Sma1t contract

a

In above screen read red colour comments toknowaboutSmaitContract calling from python code. Now contract deployed and now double click on 'rnn.bat'file tosta1t python Djangoweb se1ver and get below screen

In above screen python server staited andnowopenbrowser andenterURLas 'htt:p://127.0.0.1:8000/index.html'and press enter key to get below page

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Inabovescreenclickon 'Adrnin' linkto login as adrnin and get below screen

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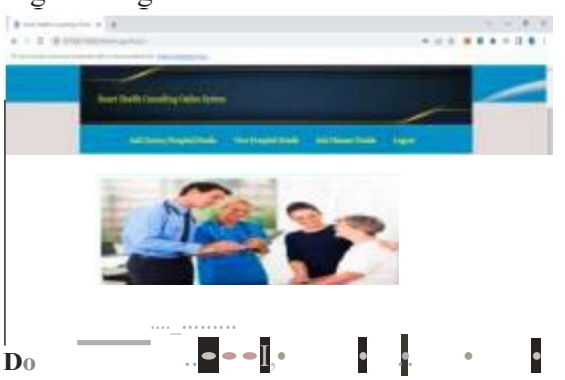
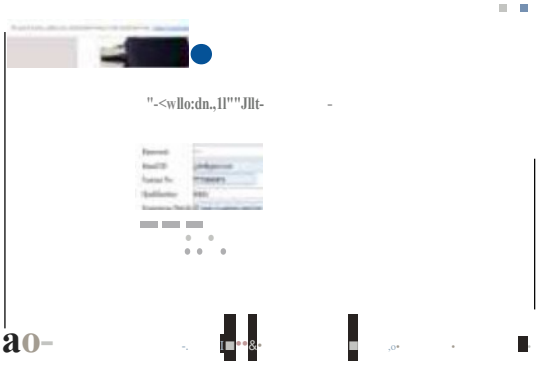
Inabove screen admin is login and after login will get below screen



Do

Inabovescreenadmincanclickon'Add Doctors/HospitalDetails'linktoadd doctordetailsandgetbelowscreen



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In above screen admin is adding doctor details and g1vmg username and password and now press'submit'tosave record and get below output

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In above screen doctor details saved in Blockchainand now click on'View Hospital Details'link toview all doctor details

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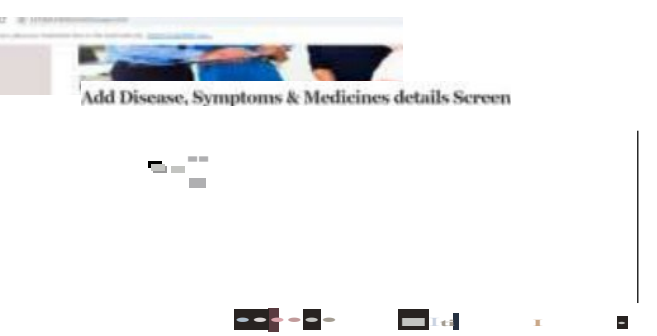
In above screen we can seedoctor details and now click on'Add Disease'link toadd disease andsymptom details



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Inabovescreenadmin adding disease andsymptoms and medicine details and then press button to get below output

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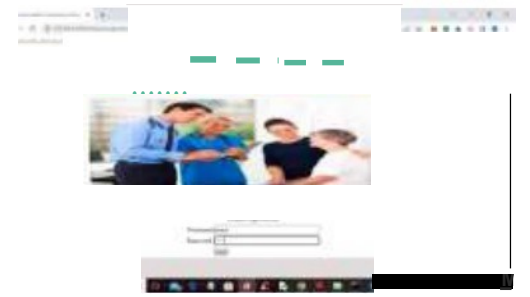
In above screen disease details saved in Blockchain and now logout and signup patient to book appointment

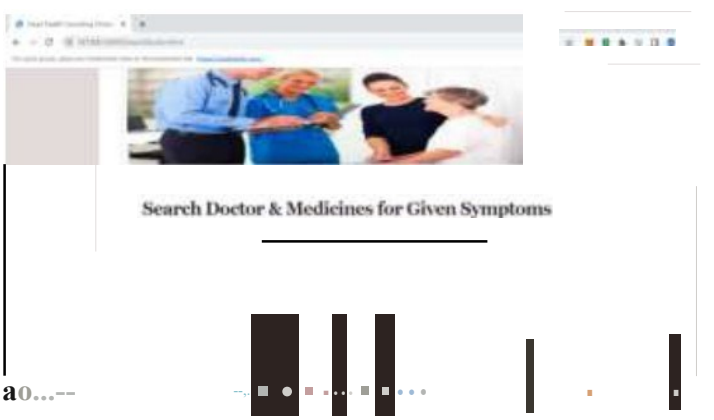
In above screen patient is entering signup details and then press button to get below output

In above screen signup details saved in Blockchain and now click on 'Patient Login'link to login as patient



Inabovescreenpatient islogin andafter login will get below screen

In above screen patient can click on 'Search Doctor' link to search disease and doctor details



In above screen patient enter some symptoms details and then press button to get consultation doctor, medicinesand disease name

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Do AYAM■IMMMMII-

Inabovescreenpatientcanviewall symptomsandmedicinewithdoctor detailstoconsultandnowclickon 'View Hospitals' to view list of hospitals and doctors like below screen

In above screen patient can view all registered hospitals and doctor details and after verifying all details and now patient can click on 'Take Appointment'link to take appointment like below screen

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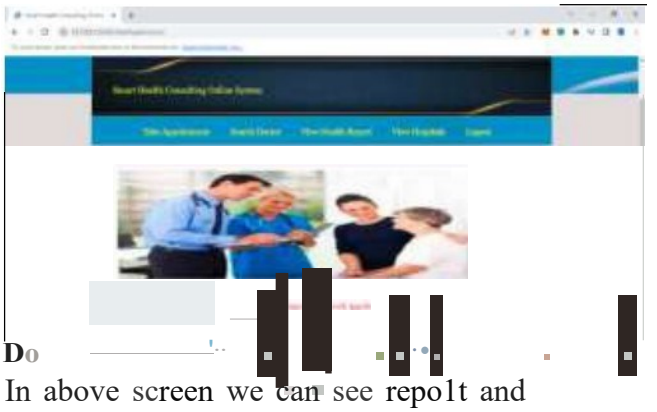
In above screen patient will enter AGE and symptoms and then upload any documentofTESTrepo1tsandthen select hospital name and press button to confinn appointment like below screen



Do

In above screen we can see repo1t and appointment confomed with Appollo hospital and now click on 'View Health Report'to view prescription like below screen

CONCLUSION

In this paper, we have presented a private blockchain-based telehealth solution. The proposed solution ensures traceabil- ity, integrity, and availability ofthetelehealth transactionsandrecords related tomedical care, diagnostics, and moni- toring for remote and at-home patients. Our proposed solu- tion leveraged private blockchain intrinsic features to ensure trust, accountability, integrity, transparency, and privacy.This research contributes in paving the way towards facilitating better medical care for people inrural andinaccessible areas. Italsoexpedites medical attention to remotely ill patients. Using the permissioned blockchain network, we were able to maintain the patient's privacy and medical infonnation securely. We showed how our system can be integrated with cloud and IPFS storage systems to facilitate the secure accessibility and traceability of immutable large-size digital contentand video calls associated with telehealth se1vicesessions.Ourproposedsystem

alongwithits implementationdetails, as well as smait contrncts and their algorithms ai·e given and studied inthis paper specifically for COVID-19 patients;however,allcanbetailoredand extended ingeneral for remote patients. In the future, we plan to deploy thefull system in a real Ethereum blockchain main network (Mainet) and build the relevant end-user Decentralized Applications (DApps).

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