



PROJECT REGISTRATION FORM

(This form should be completed and submitted on or before 11.55 PM, Friday 17th January, 2020)

The purpose of this form is to allow final year students of the B.Sc. (Hon) degree program to enlist in the final year project group. Enlisting in a project entails specifying the project title and the details of four members in the group, the internal supervisor (compulsory), external supervisor (may be from the industry) and indicating a brief description of the project. The description of the project entered on this form will not be considered as the formal project proposal. It should however indicate the scope of the project and provide the main potential outcome.

| | |
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| PROJECT TITLE (As per the accepted topic assessment form) | Sinhala Conversational Appointment Management System for Medical Domain |
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| RESEARCH GROUP (as per the Topic assessment Form) | Robotics & Intelligent Systems |
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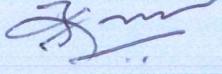
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| PROJECT NUMBER | 2020-175 | (will be assigned by the lecture in charge) |
|----------------|----------|---|

PROJECT GROUP MEMBER DETAILS: (Please start with group leader's details)

| | STUDENT NAME | STUDENT NO. | CONTACT NO. | EMAIL ADDRESS |
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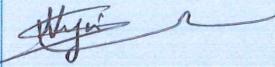
SUPERVISOR Details

Prof.Koliya Pulasinghe

| | | |
|------|--|------|
| Name |  | Date |
|------|--|------|

CO-SUPERVISOR Details (will be assigned by the Supervisor, if necessary)

Miss Vijani Piyawardana

| | | |
|------|--|------|
| Name |  | Date |
|------|--|------|

EXTERNAL SUPERVISOR Details (if any, may be from the industry)

| Name | Affiliation | Contact Address | Contact Numbers | Signature/Date |
|------|-------------|-----------------|-----------------|----------------|
| | | | | |

ACCEPTANCE BY CDAP MEMBER

| Name | Signature | Date |
|------|-----------|------|
| | | |

PROJECT DETAILS

Brief Description of your Research Problem: (extract from the topic assessment form)

Nowadays in Sri Lanka, all of the e-channeling systems are based on the English language. Mostly E-channeling systems are used by people in western province comparing to other provinces. The reason is the erudition that they have is very impecunious in the English language.

Sometimes, people having diseases such as Short-Term and Long-Term Incapacitation and People with dyslexia, are incapable of using communicate an E-channel system.

Most of the Sri Lankan E-channeling systems are web-predicated and utilizing the web-predicated system in mobile is Minimize Celerity, sometimes browser support is very impissant and not facile to utilize on mobile. It is not user-friendly for mobile.

Many people are not aware of the drug details given to them. Normal ordinary people would find it hard to identify particular drugs prescribed to them and also Drug details appear to be in the English Language.

Nursing a person who had faced an accident cannot be totally covered by an ordinary group of people. Their medical knowledge would not be sufficient enough to do or give medical treatments to a patient.

Most of the patients don't know what the specialization of the doctors is, and who are the best doctors of their diseases. They only know the diseases that they have at that moment.

Some of the patients know doctor's name but they will not know the details about the doctor, such as the hospital where, the doctor is available, time schedules of the doctors.

Some patients know all the details and they want to get an appointment with doctors, but they couldn't make it, because they will face interaction problems with a system, the system will perform the English language they can't understand it.

Patient have to pace on above difficulties in this kind of a challenging situation.

Description of the Solution: (extract from the topic assessment form)

Human computer interaction (HCI) is a major role in interfaces between a human and machines. Dialogue system, conversational system, Chatbot, voice controller interface and personal assistants' system are the example of HCI system that have been developed to Interaction with a human using Natural language. That type of system helps users (In our system user is a patients) to find a useful information for their needs. Thus, a number of hospital organizations prefer to use an automated system such as a chatbot to automate their customer service. Because that type of system is easy deliver to user. As the first solution, we identified develop a Chatbot for interaction with a patient.

For some disabled people who might struggle, or find it impossible, to work with a mouse or keyboard, speech recognition enables them to communicate with a system effectively. It lends a hand to those with physical impairments and dyslexia and also reduced time and it less stressful than conventional handwriting or typing. Therefore, as the second solution is which allows a user to perform voice commands such as text commands.

Today mobile usage is increased in the world, and most people are using smartphones. Also, Sri Lankan people are the same and most of them used an internet on their smartphones. As a solution, we developed a mobile app, which is easy to deliver a better service in patients.

Patients also can find the details of the drugs by entering the drug name. If a patient does not aware of the drug, what is the way that should use the drug, for which medical issue? These problems will be solved through the system.

In Sri Lankan population is 22,576,592 (July 2018 est.). in 87% percentage can speak the Sinhala Language. 23.8% lower percentage of people can speak the English language (2012 est.) and 91.9% percentage can read and write. (Copyright @ Department of Census and Statistics server details) According to the survey Most of the Sri Lankan people can communicate and understand the Sinhala language. Thus, as the language problem solution is, we are using the Sinhala language. Therefore, we used Natural Language Processing (NLP). NLP is a way of computers to analyze, understand and derive meaning from a human language such as English, Sinhala and etc.

Thus, the need of using artificial intelligence has been increasing due to the needs of automated services. However, devolving smart bots that can respond at the human level is challenging. And it can give to user a better service and solve the user problem. In our research, we identified user problems, is getting doctor visiting appointments for patients. Our system provides information about doctors, hospitals, and channeling information allowing patients to easily make appointments.

Main expected outcomes of the project: (extract from the topic assessment form)

Create a mobile application as the final outcome of this research problem. In our country most of the middle aged and elders cannot understand English and they do not possess user experience about Information system. Most of the medical information system are now looking forward for automated Sinhala conversation system to help the customers (patients) to get a Doctor appointment on their health issues. The system has the ability to satisfy users. That is the expected outcome in research. End of the research patient can,

The required doctor Channeling by Patient using Sinhala voice command (their mobile phone using).

- a. The patient doesn't have a clear idea (Time, Place, Doctor, Diseases).
- b. The patient has a clear idea.

In the system provide information about,

- Doctors information
- Hospitals information
- channeling information
- And by using the system patient can channel a doctor.

WORKLOAD ALLOCATION (extract from the topic assessment form)

(Please provide a brief description about the workload allocation)

MEMBER 1

Understanding user Natural Language.

In this research we develop a mobile application. As first step, need to Understand Natural Language. It has several steps,

(A) User Identification

Email Verification

Finger Print Scanner

Face Recognition

Encrypted Photo verification

(B) Voice Processing**1. Saving user speech in volatiley.**

Patient can give a Sinhala voice command, and the speech audio file is stored volatiley in the phone.

2. Voice to text

After storing that audio recode file, convert it to Sinhala text.

(I) Creating Sinhala Phonemes dictionary and training

Ex: In Sinhala have 47 Phonemes and 14 vowels 33 consonants.

| Character | Phoneme |
|-----------|---------|
| අ | AH |
| ආ | AA |
| ඇ | E |
| ඈ | EE |
| ඉ | IH |

(II) Create Sinhala English Dictionary (Medical Terms)

Ex:

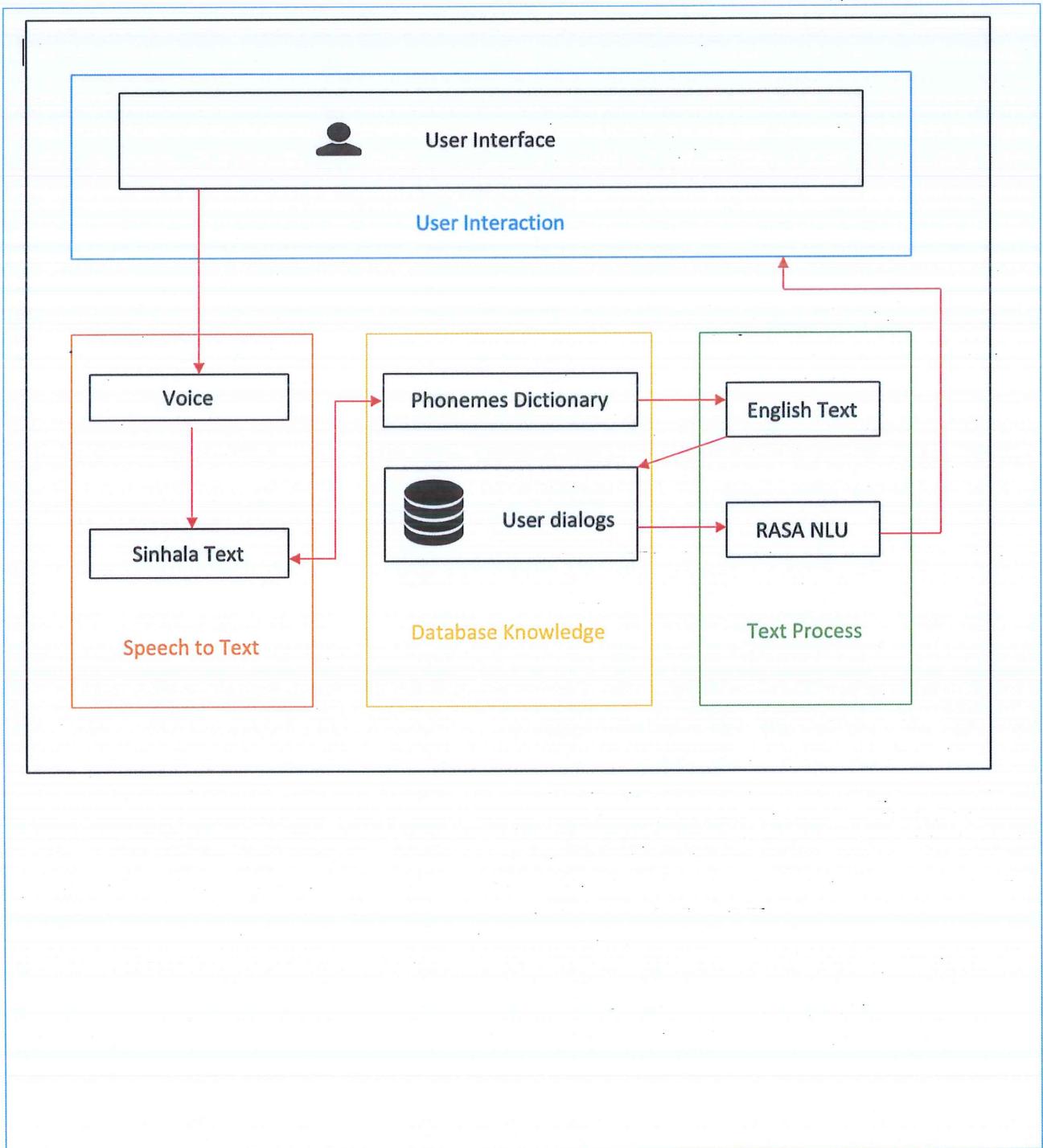
| Sinhala Word | English Word |
|--------------|--------------|
| හිසරදය | headache |
| උණ | fever |
| බඩී අමාරුව | stomachache |

- Convert Sinhala text to English text.

That created Dictionary using Sinhala word convert to English alphabetic word. And store in json formatted.

- Insert Data in Database.

After formatting that Text value store in a database.



MEMBER 2

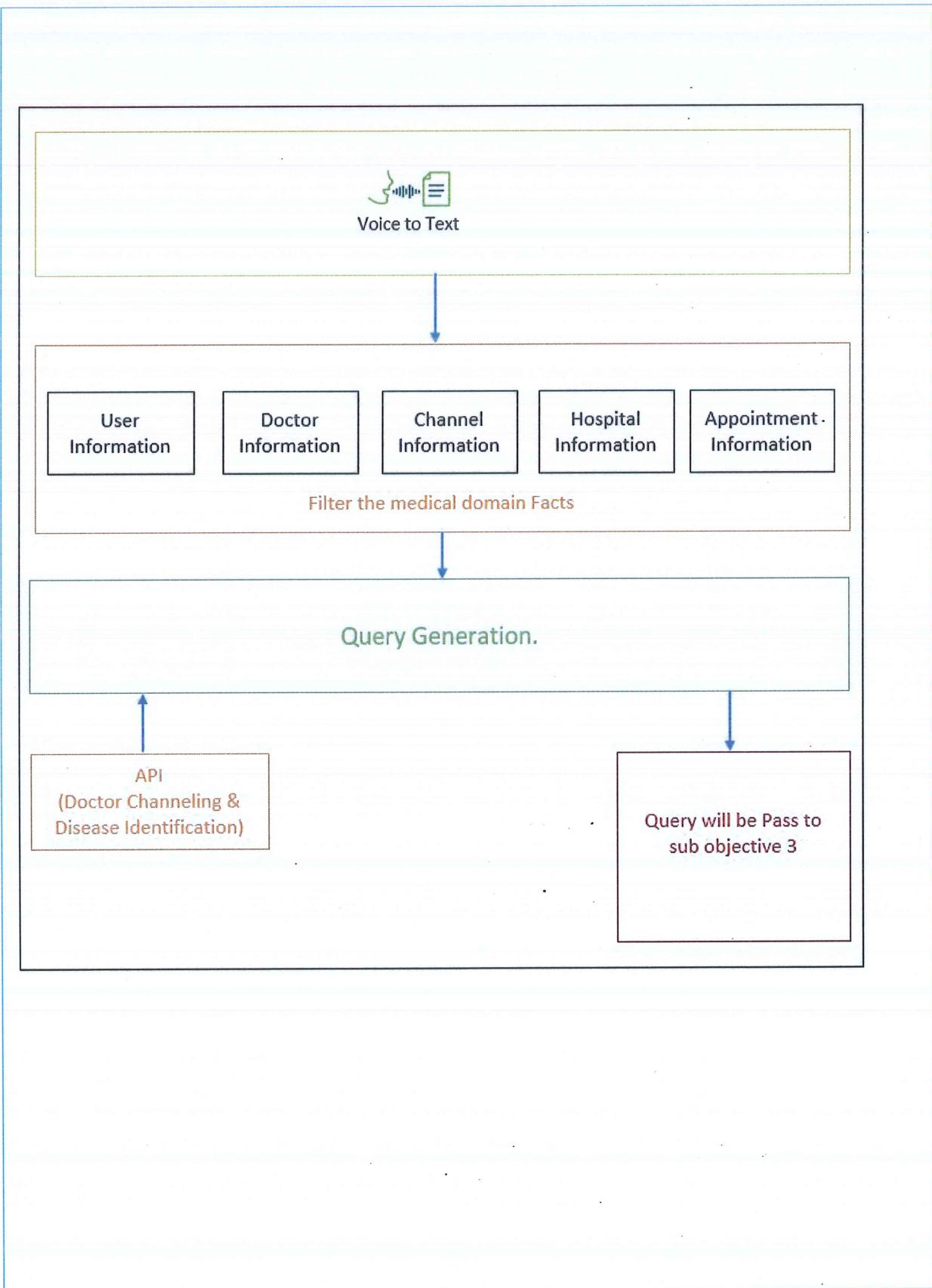
Natural Language Process

1. The users voice data extracted to Sinhala sentence which is given from voice to text translator are needed to Identify facts for filter those problems and important facts to give solutions. When start the filtering by system simultaneously start java key factor service for authenticate and give permission levels to users and change filtering results in different medical centers. As examples,

- When Patient using system, we installed in Nawaloka Surgical it should be only filtered and search Doctors and channelings in Nawaloka Surgical. Patient's Search results should be only for location that software installed Channeling center.

After identifying the keywords using algorithm, need to generate query using MySQL or Elastic Kibana with Mongo DB

2. After this there is another thing when patient logging to system, he/she need to have details of their history, so we can create dashboard. After they entering to their profile adding their details, they can see who the doctor they met, what is the date finally they met and all the details of their disease.
3. When patient Make channeling appointment to doctor it should be recorded in database and need to send message to channeling center counter for mentioning the report and when the channeling date in channeling counter patient should confirm their appointment and if patient need to cancel appointment it should be done before one hour of the channeling time for these we decided to use blockchains,
 - A Practical Introduction to **Blockchain with Python**. ... As its core, a **blockchain** is a distributed database that allows direct transactions between two parties without the need of a central authority
4. Have to check whether the request is for diseases identification or doctor channeling in the patient's question. Because of this have to create API for relevant medical question stream. Necessary medical facts data retrieve form created APIs. Those medical facts used for query generation process.



MEMBER 3

Connecting an NLU into Rasa framework

The import facts of the sentence identify and generate query which is given by previous function need to be trained medical terms knowledge. In this phase must Connecting an NLU into Rasa framework. Rasa is a standard infrastructure layer for developers to build, improve, and deploy better AI assistants. In here there are two data trainee types are available.

First one is Rule base type. For that case TensorFlow is the most suitable one. Because in here trained medical terms data already available in our database. Then check the database and generate the reply using that database.

Second one is AI base type. For that case json format is the most suitable format. Received query from the Natural Language Process will be use to identify the relevant response for the medical question.

Have to extract the user voice into text, it shows an Interface. To do, Important to connect a RASA NLU, therefore, have to train data in JSON format. And also received response text from the Dialogue Management Process will be retrieved in interface.

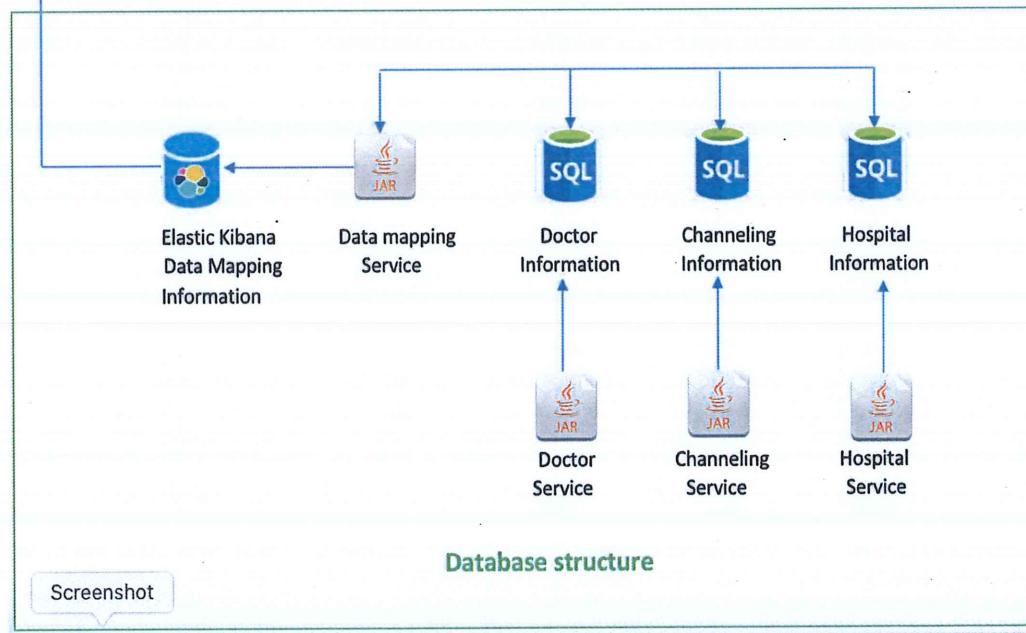
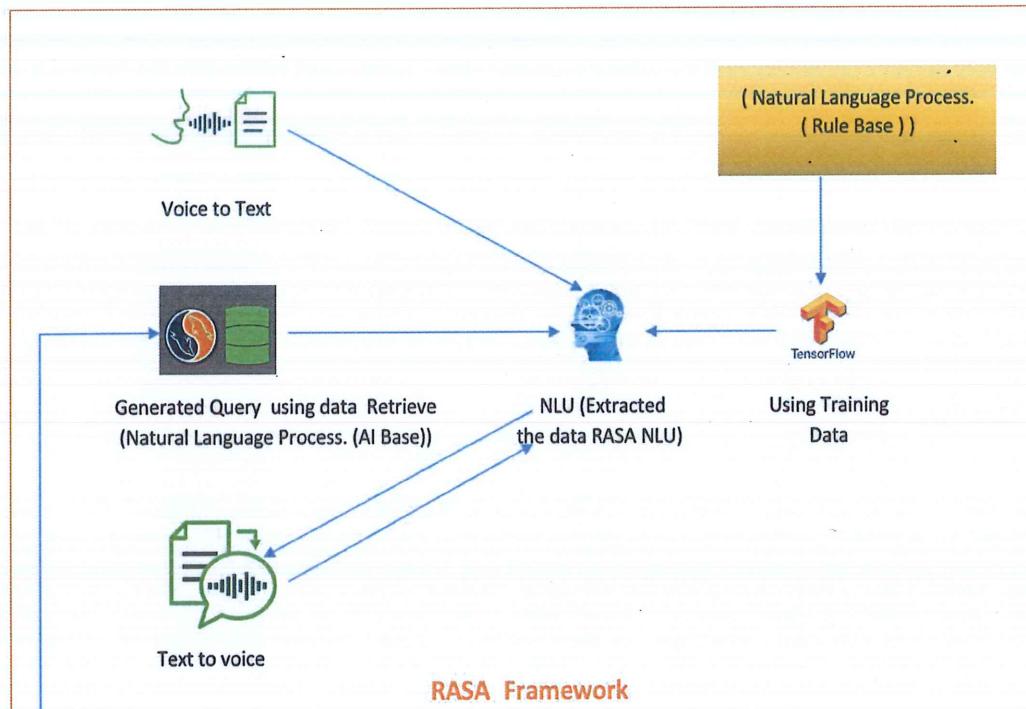
Have to create three SQL database for Doctor Information, Channeling Information and Hospital Information. Then create three Java Services for the relevant SQL databases. These three Java Services are mapped with each other. And these three services are running in update situation. Otherwise want to retrieve the data it is happening using Elastic Kibana.

Elastic Search is an open source, RESTful distributed and scalable search engine. Elastic search is extremely fast in fetching results for simple or complex queries on large amounts of data (Petabytes) because of its simple design and distributed nature. It is also much easier to work with than a conventional database constrained by schemas, tables.

Elastic Search provides a distributed, multitenant-capable full-text search engine with an HTTP web interface and schema-free JSON documents.

Kibana is an open source data exploration and visualization tool built on Elastic Search to help you understand data better. It provides visualization capabilities on top of the content indexed on an Elasticsearch cluster.

Using trained medical terms knowledge used to next phase which generates the dialogue for the medical question that user asked.



MEMBER 4

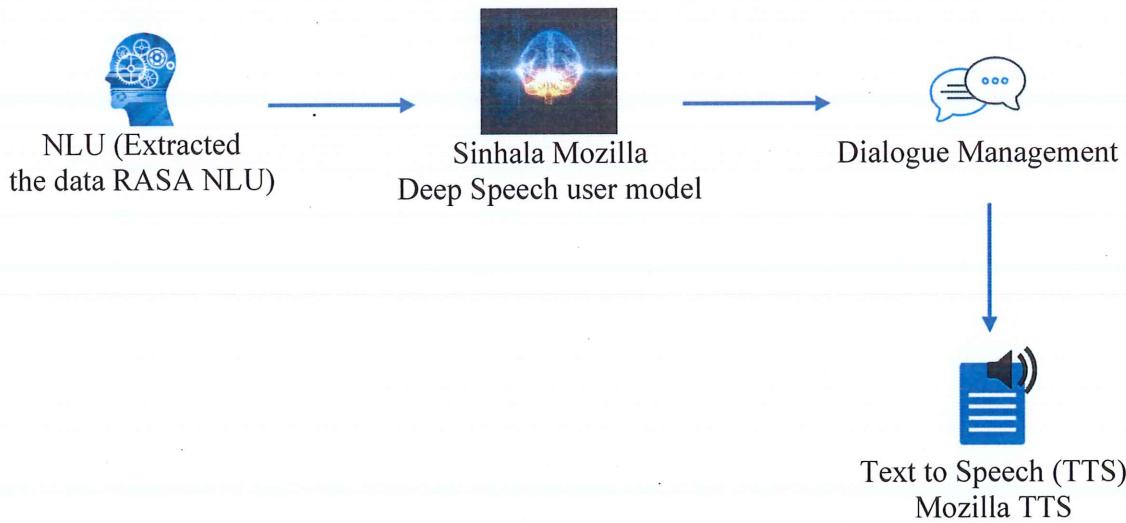
Dialogue management of the Bot

The knowledge of the trained medical items which is the outcome of the previous function is used to generate the dialogue for the medical questions that the user asks. In this phase we have to create the Sinhala Mozilla Deep Speech Model for an AI Robo. It's an automatic speech recognition (ASR) engine which aims to make speech recognition technology and trained models openly available to developers.

Generated Sinhala text response will be sent to the previous Natural Language Understanding Process from this Dialogue Management Process. Simultaneously this Sinhala text will be converting in to the voice command.

Through this dialogue management phase, the process of converting text to speech is taking place by using Mozilla TTS. The aim of the Mozilla TTS is a deep learning-based Text to Speech engine which is low in cost and high in quality. TTS includes two different model implementations which are based on Tacotron and Tacotron2. Tacotron is smaller, efficient and easier to train but Tacotron2 provides better results, especially when it is combined with a Neural vocoder. TTS provides a generic data loader easy to use for new datasets.

By being with this, you can hear a sample generated voice from hereby the end of this process a response dialogue will be generated.



DECLARATION

"We declare that the project would involve material prepared by the Group members and that it would not fully or partially incorporate any material prepared by other persons for a fee or free of charge or that it would include material previously submitted by a candidate for a Degree or Diploma in any other University or Institute of Higher Learning and that, to the best of our knowledge and belief, it would not incorporate any material previously published or written by another person in relation to another project except with prior written approval from the supervisor and/or the coordinator of such project and that such unauthorized reproductions will construe offences punishable under the SLIIT Regulations.

We are aware, that if we are found guilty for the above-mentioned offences or any project related plagiarism, the SLIIT has right to suspend the project at any time and or to suspend us from the examination and or from the Institution for minimum period of one year".

| | STUDENT NAME | STUDENT NO. | SIGNATURE |
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