Relax Me: Natural Language Processing and Artificial Intelligence

Attanayake A.M.S.D, Hettiarachchi P.H.A.I, Pathirathna P.J.K., S.G.S Fernando
Sri Lanka Institute of Information Technology Computing (Pvt) Ltd

Abstract: Natural Language Processing (NLP) is a major area of artificial intelligence research, which in its turn serves as a field of application and interaction of a number of other traditional AI areas. This research paper present the design of a mobile-app-based collaborative stress control system named Relax Me and a process for its usage. The aim of Relax Me is to act as a self-help therapy or a help and guide the user by giving best and fast solutions for stress matters where A/l and O/l students face in their day to day life routine. The target audience of the system is Advance level and ordinary level school students. The goal of this contribution is to systematically investigate the possibilities of integrating concepts related to natural language processing (NLP) and Artificial Intelligence (AI). This system consists of chat bot and a to do task event. Availability of a fully functional interface will allows the O/l and A/l students to gain set of solutions related stress problems.

Keywords: Artificial Intelligence (AI), Natural language processing (NLP), Question-Answering (QA), chat blot, time management.

Introduction

Artificial Intelligence and Natural language processing is branch of Science which deals with helping machines find solutions to complex problems in a more human-like fashion. This generally involves borrowing characteristics from human intelligence, and applying them as algorithms in a computer friendly way. A more or less flexible or efficient approach can be taken depending on the requirements established, which influences how artificial the intelligent behavior appears. An important area of artificial intelligence called Natural Language Processing deals with analyzing and purposefully manipulating human languages with the help of computers. NLP can be divided into two parts such as developing core technologies for processing language and employing core technologies for processing text and speech, in order to build NLP applications. Rest of the paper covers as shown below. Section II covers background and related works. It includes all the research papers which were referred. In Section III covers the methodology of this research paper. It includes various degrees of detail, methodology, materials, and procedures of the research area. In Section IV cover the results where the findings are described, accompanied by variable amounts of commentary. In Section V covers discussion section of the research paper. In Section VI covers the conclusion of this proposed research paper. This research paper will conclude by summarizing the design of this mobile application which created to overcome stress level of students and outline possible developments in the future.

Background

Students seem to experience some level of stress, which causes physical and mental wear on the body and mind, in almost all the time. Due to this, stress in students can affect the ability to concentrate on their studies which conducted for them and it hinders work effectiveness too. This theoretical research paper illustrates how this mobile application helps to overcome stress level of students. According to other research papers, there are many systems developed using Artificial Intelligence, Natural language processing in different field areas such as in university level, health side etc. So up to now there are no automated devices, systems or especially mobile application system which develop for A/L and O/L students to overcome their stress level. In this section, we discuss the Artificial Intelligence (AI), Natural Language Processing (NLP), the technologies to support balancing of daily study routine which helps students in releasing stress. The researchers have developed many applications based on this concept. The literature provided below is helpful for understanding general solution to the problem which inserted to the system [1].

Using of Artificial Intelligence

Using of AI, Relax me system will give the best solution to the problem inserted. Artificial intelligence (AI) is the intelligence of machines and the branch of computer science that aims to represent
human expertise through computers. Textbooks define the AI field as "the study and design of intelligent agents," where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success. By using of libraries in machine learning which a part of AI is, the system can predict best answer for the given problem. AI focuses on design and implementation of machines to accomplish goals [1].

Using of Natural language processing

An important area of artificial intelligence called Natural Language Processing deals with analyzing and purposefully manipulating human languages with the help of computers. NLP is closely related to Computational Linguistics, which employs computational tools to model phenomena in natural languages. NLP can be divided into two parts:

(i) Develops core technologies for processing language in two forms, speech and text, to perform phonological, morphological, syntactic, semantic and pragmatic analysis.

(ii) Employs core technologies for processing text and speech, in order to build NLP applications, such as information retrieval, information extraction, question answering, summarization, machine translation, dialogue systems.

NLP techniques are used in applications that make queries to databases, extract information from text, retrieve relevant documents from a collection, and translate from one language to another, generate text responses, or recognize spoken words converting them into text. From the question and answer point of view, interfaces database query language, supported by the underlying database management system. The domain dependent knowledge contains information specific for the domain of interest [2]. By using of libraries within NLTK the system can detect to which category, the particular question belongs to. NLP-based question and answers system may utilize machine learning to improve their syntax rules.

NLP Applications

Major NLP applications can be grouped into three categories: (i) semantic analysis (ii) Information management (information retrieval, automatic summarization, information extraction, question answering), and (iii) speech processing and dialogue systems. Due to space limitations, we cannot cover all NLP technologies and exclude, for example, machine translation, handwriting recognition, or spelling correction. Semantic analysis, Information retrieval, question answering methods have been used to develop this Relax Me system.

Semantic analysis is the task of assigning semantic structure to unstructured information. Information retrieval should be tightly coupled with semantic processing, providing more flexible matching strategies than string based techniques. Information extraction is concerned with analyzing documents, detecting and extracting relevant pieces of information, such as the topic, participants, events, and their effects. In question answering, natural language queries are used to retrieve documents, detect the most relevant segments and possibly directly extract an answer to the original query [3].

Under system implementation, the interface of the application is a simple web page. When the user accesses the system from his handheld device, a multimodal browser is open. After a setup procedure where the user profile is settled, the multimodal browser asks the web server for the php file and the dialogue interaction starts. The web server executes the php commands, submits the query (user input) to the chatbot, waits for response which is given through python code using of libraries [5].

Methodology

A review of relevant literature in accordance to the objectives of this paper were explored and adopted in order to solicit the right information needed for the analysis. In accordance to the goals of this research/project, the Software Development Life Cycle methodology was employed to carry out this research. Consistent with the design research framework, this research will be carried out in the following five steps:

Requirement gathering and analysis

Identify the exact requirements of the Relax Me. An important task in creating a software program is extracting the requirements or requirements analysis. There can be incomplete, ambiguous, or even contradictory requirements at this point. In requirement gathering phase, collected information from the leading schools in Sri Lanka. Through the discussions with a/l and o/l students and gather information about the problems they face. At the same time, found out what were their requirements, the techniques used, how they operate, their strengths and weaknesses and came up with a solution that is
the system, Relax Me which overcomes all prevailing problems in the identified systems.

Design

The primary objective of the design phase is to create a design that satisfies the agreed application requirements.

Architecture design –
An important step during this stage was the planning about the hardware, software and communications infrastructure for Relax Me.

![Architecture diagram](image)

Figure 1: Architectural diagram

Figure 1 illustrates the system architecture diagram. Student can convey his/her stress problem given to the interface provided in the mobile application. Then the particular words will send to the AI chat system which has the internet connection. And the AI chat system has a connection to the backend database where it is, implemented with the data which is given by the psychologist. Through the database, AI chat system analyzes the following data and predicts a best solution according to the stressful situation and sent to the mobile phone.

Interface design –
Determine the way in which the user will interact with the system and the nature of the inputs and outputs that the system accepted and produced. The interface was created in such a way, where the data was captured and minimized key stroke.

Database and file design –
In this stage, the tables which was created in the system was produced along with the primary keys and relevant validations and constraints. The database was linked with the system developed.

Program design –
During this phase, Questing Answering part is that designed to interact meaningfully with, and adapt to, the users’ input. Different QA part use different Natural Language Processing (NLP) techniques in their system. NLP systems may be structural, i.e. focused on grammar and logic, or non-structural, i.e., focused on words and statistics.

![QA Architecture](image)

Figure 2: QA Architecture

Analysis of the question

- Category → subject/relationship/family problem
- Keywords → verbs used in question according to the category. It may be a set of words in negative and positive ways.

IDEA OF (QA)

Determine the semantic type of the expected answer “My parents blame me because of low marks for subjects” is looking for a answer to solve the problem. Retrieve python files that have the keywords “low marks”, “parents”,” blame”, and “subjects”. Look for named-entities of the proper type near keywords. Look for a better solution for whether the problem categorize into a family matter or subject matter with the use of python files where huge number of data are stored.

Implementation

The solution which mapped was broken down into several sub-systems. The Relax Me was developed as a mobile application with python. Machine language which is a part of Artificial intelligence and natural
language processing were the main techniques of the Relax Me. In Artificial intelligence and natural language processing used some relevant libraries which support for the product.

Testing

After modules are developed by each member, they will individually be tested. Thereafter, the modules will be integrated to a single system and a complete system testing will be performed. Testing and evaluation, simply confirms that the product will work as it is supposed. The unit testing, system testing were applied to the system to check whether the Relax Me system working properly.

Results

This chapter describes the expected result and actual outcome for each test case of testing each module. The online mobile application system, Relax Me has been tested thoroughly for various android mobile devices with various system dimensions, properties and configurations. The application can be successfully run on all those devices without any difficulty. All the screen sizes can be matched by the system to run in any mode either portrait or landscape. Also the system can identify the problem and predict an exact answer. Some of the expected results of the system shown below.

Home page of the application will gives the root to the every page or the interface of the application.

- User logs into the System with corresponding password and username after registration.
- After logged in to the system the user can use any option which needed to be done by the mobile application.
- If the user select the chat with me option then, user can insert the particular problem in to the system.

- Insert the details of the user into the system.
User can insert the problem using the interface given, Eg:- I have a maths problem.

After identifying the words and the category, the system will provide an accurate answer for the problem given.
Answer: - Discuss maths problem with classmates and know the subject well.

Discussion
This research study was carried out to provide solutions to overcome the problems students face while studying. In analyzing the research problem, information were gathered from the questioners, interviews, web sites, blogs, journals and articles that are mentioned in references section of this dissertation. The Literature survey provided all the needed background on the research areas. The knowledge gained through the literature survey was the main source and main support to carry out this study. According to the research papers, it is identified that there is no proper mechanism to overcome stress. In order to provide a solution, two technologies were used such as machine learning and natural language processing. With the use of some libraries, it was able to predict an exact answer according to the problem. After identifying the core components of the system, developed a system architecture diagram to support the implementation. Documentation is carried throughout the duration of the project along with the problem analyzing and system designing.

Conclusion
The system Relax Me presented an efficient and affordable method for real time problem solve system. There are two methods used they are, categorize the problem and give the best solution for the problem. Question answering is an exciting research area, in which it lies at the intersection of information. And also questioning and answering part is that are designed to interact meaningfully with, and adapt to, the users’ input. So the Limitations that can be occur in the system, such as:

Answers questions indirectly- The system may get the problem indirectly and provide wrong solution.

Does not attempt to understand the “meaning” of user’s query or documents in the collection- Sometimes the system will not able to identify the right category of the problem such as whether it is a subject matter, relationship matter or family matter. Thereby system will not able to give a best solution to the problem.

In order to overcome these limitations this described above, so with the use of the NLP techniques, the system can identify the category of the problem. If the user problem based on two categories, so then it is directed to the AI technique. Then it will predict and give the best solution by asking more questions with the user. As for future research the application is supporting only for the android platform. In future try to expand the application to work on different mobile operating systems such as IOS.
6. References


