AI FOR HUMAN ASSISTANCE

Dr.L.Suriya Kala[1], S.Nirmal[2]
[1]Assistant Professor,Saradha Gangadharan College, Pondicherry
[2] UG –III B.E Computer Science, R.M.K Engineering College, Chennai, Tamil Nadu

ABSTRACT
A robot has been designed to assist humans in reaching their desired destination. The majority of people today are freshers and unfamiliar with new places. With very little to no awareness of the specific locations, people waste a lot of time navigating through the different available paths. This seems to be a drawback in an arena where all the focus is on getting instantaneous solutions to problems. So, our designed robots assist humans to travel the shortest distance from one place to another place. These types of robots are planned to be implemented in colleges, airports, supermarkets, and many other public places. In the present work, a path following control for assistance robots is designed. The driver is designed to help blind people reach a destination through a path. This work is on the premise that person must choose the moment when the robot must move due to its is using as support. Plus, a linear velocity is generated by an angular velocity which guides the person along the path, whenever the movement is desired by the user. A simulation is performed to verify that the operation of the controller is correct, and finally, experiments are performed on an experimental platform.

Keywords : Artifical Intelligence, Internet of Things, Natural Language Understanding, Magnetic Resonance Imaging

1.INTRODUCTION

Problem Statement

This project aims to assist people who are new to public places. Here, the robot will get input from the human who needs assistance with speech. After that, the voice gets decoded. Now, the robot will assist the humans to reach their desired destination. The designed robot can detect the obstacles on the way and acts according to them.

Project Scope and Objective:

Scope of the Paper:

The scope of the paper is very promising. This paper finds its application in various fields. It can be used to assist the old aged and handicapped people in public places. The project can also assist in short-distance transportation. It can also be used to monitor the occurrence of criminal activities. Therefore, enforcing law and order.

The objective of the Paper:

In the current work, a way of following control for help robots is planned. The driver is intended to help blind individuals arrive at an objective through away. This work is on the reason that individual should pick the second when the robot needs to move because it is utilized as help. Furthermore, a straight speed is produced by a rakish speed which directs the individual along the way, at whatever point the development is wanted by the client. A reproduction is performed to confirm that the activity of the regulator is right, lastly, tests are performed on a trial stage.

2. Literature Review

[1]Muthmainnah, Prodhan Mahbub Ibna Seraj and Ibrahim Oteir (Oct 2022)

Playing with AI to integrate Human-computer Interaction Technology and improve Critical Thinking Skills.

Merits

AI-based instruction promotes students' self-confidence, open–mindedness.
It helps to improve the Students' abilities.

Demerits

Some people do not want to learn new technologies, preferring to stay in the old ways.

Students are not to work together with computer systems in research, classwork, and data analysis.

[2] Pravin R. Kshirsagar,D. B. V. Jagannadham, Hamed Alqahtani,Quadri Noorulhasan Naveed, Saiful Islam,M. Thangamani and Minilu Dejene(Jun 2022):

The use of AI approaches has been addressed to enhance the quality of teaching and learning. Student assistance teaching, learning, and administration are also addressed in the discussion of students' adoption of AI.

Merits

AI helps them to improve their educational abilities.

AI education will become more accessible in the future, it was predicted.

Artificial intelligence algorithms are used in a hybrid teaching mode in this work to examine students' attributes and introduce predictions of future learning

Demerits

Many of these variances lead to changes in learning outcomes and instructor teaching approaches.

Teachers can spend more time connecting with students by outsourcing basic processes like assessing, categorizing, and scheduling digital items.

[3] G. Preethi, Abishek.k, Thiruppuga S, Vishwaa D A (May 2022):

Voice Assistants are also growing more and more important in our daily lives. This voice Assistant will Gather the audio from the microphone and then convert that into text.

Merits

It is user-friendly and it has a voice assistance option for opening any app.

It can be connected to the IOT and works with various operations like turning on and off all electrical applications such as lights, fans AC, etc by voice control.

Demerits

Time-consuming process.

The existing system doesn't have any voice assistance option for opening any application.

[4] Golda Dilip, Ramakrishna Guttula, Sivaram Rajeyyagari, Hemalatha S, Radha Raman Pandey, Ashim Bora, Pravin R Kshirsagar, Khanapurkar M M and Venkatesa Prabhu Sundramurthy (Jan 2022):

Comrade robots may do things like senior citizen's home automation, home equipment control, safety, and well-being sensitivity & in emergencies, and routine duties like navigating in the outside environment.

Merits

Robots help the elderly people with day-to-day activities and help the elderly people in the health care system.

Robots have improved human life and industry.

Demerits

Robots and AI would eventually eliminate most of the jobs is increasing.

[5] Himank Bhudhiraja, Nikhil Sharma Intelli Assistant–AI-based Personal Assistant (May 2021) :

In this research, an effort has been made to provide a platform for the users to ask queries and gather information about a specific topic from google and represent it through various audio (or) textual messages.

Merits

Chatbot has been used that take unanswerable queries as feedback and store the query and its answer in its dataset.

If it comes across the same query in the future it would be answerable and making it more answerable.

Demerits

Existing chatbots do not learn and improve their dataset over certain questions being asked by the users.

Users got limited because of the limited dataset.

3.EXISTING WORK

Data in Google Guides might have been mistaken. Sporadically, ambiguities and defects in area information might deliver a course that doesn't take you to the objective you anticipate. Google Guides doesn't have authorized data on surprising circumstances, for example, streets harmed by climate, hindered by road fairs, or adjusted by late development work. A few distant areas may not be in Google Guides

4.PROPOSED WORK

A robot has been designed to assist humans in reaching their desired destination. Most people today are freshers and unfamiliar with new places. With very little to no awareness of the specific locations, people waste a lot of time navigating through the different available paths. This seems to be a drawback in an arena where all the focus is on getting instantaneous solutions to problems. So, our designed robots assist humans to travel the shortest distance from one place to another place. These types of robots are planned to be implemented in colleges, airports, supermarkets, and many other public places. In the present work, a path following control for assistance robots is designed. The driver is designed to help blind people reach a destination through a path. This work is on the premise that person must choose the moment when the robot has to move due to it is using as support. Plus, a linear velocity is generated by an angular velocity which guides the person along the path, whenever the movement is desired by the user. A simulation is performed to verify that the operation of the controller is correct, and finally, experiments are performed on an experimental platform.

5. USE CASE DIAGRAM

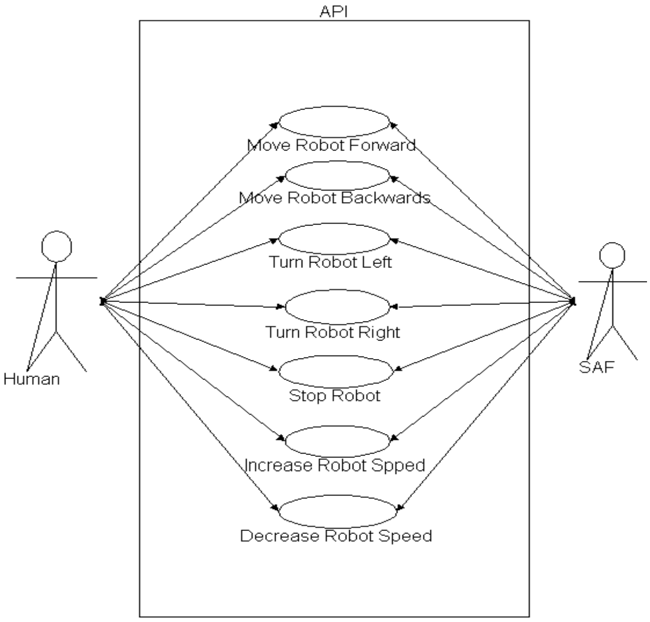


Fig 1 Use case diagram for robot assistance

DESIGN

Progressions in robotization and mechanical technology have made it progressively conceivable to integrate modern robots into shared space fabricating offices close by people. In assembling processes, robots have the near advantage of performing exact developments with reiteration and consistency, while people hold the upside of getting to the next level of discernment, acknowledgment, and imaginative navigation. Dynamic joining among people and robots considers the usage of the individual advantages of people and robots to consider more vigorous assembling processes. Surface completing tasks, for example, deburring, chamfering, sanding, crushing, and cleaning are significant cycles for creating completed items. Currently, large numbers of these activities are performed physically by the administrator because of detecting and vulnerability dealing with impediments for robotization, complex

part calculations, and challenges in workpiece enlistment in the work area. Human-robot coordinated effort (HRC) is accordingly imagined in such cases to further develop task execution. In any case, the presentation of people and robots in a common workplace has implications for the well-being of the cooperative framework notwithstanding how the different executions of mechanical help can influence separate exhibitions of people and robots, and successfully their common cooperative presentation.

6. SYSTEM ARCHITECTURE

To cope with such use cases as described above, an IPA may need to make use of several services describing the capabilities of the IPA. These services may be selected from a standardized marketplace. For the remainder of this document, we consider an IPA that is extendable via such a marketplace. This kind of IPA features the architectural building blocks shown in the following figure.

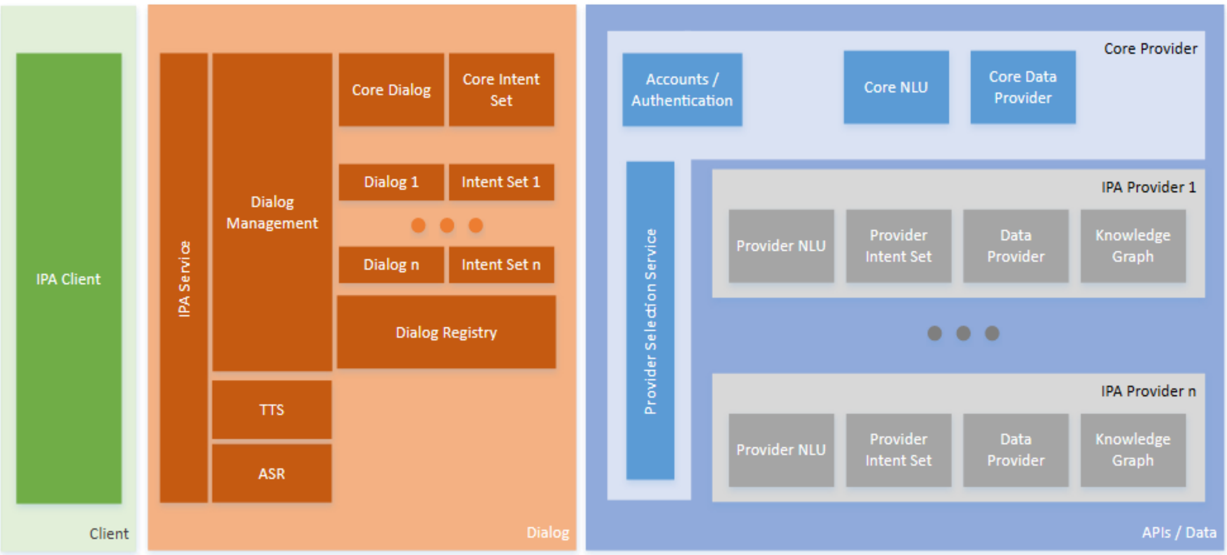


Fig 2 System Architecture

IPA Architecture

This architecture comprises 3 layers that are detailed in the following sections

Client Layer Dialog Layer APIs / Data Layer

Actual implementations may want to distinguish more than these layers.

Client Layer

IPA Client

Clients enable the user to access the IPA via voice with the following characteristics.

Usually, IPA Clients make use of a microphone to capture the spoken input and a loudspeaker to respond. As an extension IPA Clients may also capture input via text and output text. As an extension IPA Clients may also capture input from a specific modality recognizer. As an extension IPA Clients may also capture contextual information, e.g., location. As an extension, an IPA Client may also receive commands to be executed locally. As an extension, an IPA Client may also receive multimodal output to be rendered by a respective modality synthesizer.

Dialog Layer

IPA Service

General IPA Service API that mediates between the user and the overall IPA system.
The service layer may be omitted in case the IPA Client communicates directly with Dialog Management. However, this is not recommended as it may contradict the
principle of separation of concerns. It has the following characteristics.
The IPA Service functions as an interface between the IPA Client and the Dialog Management and Provider Selection Service. The output from the ASR is forwarded to the Provider Selection Service to determine to mean. Alternatively, the IPA Service may receive multimodal or text input from the client and forwards it directly to the Provider Selection Service to determine to mean. Alternatively, the output from the modality recognizers and contextual information may be forwarded directly to Dialog Management.

Dialog Management

The component that receives semantic information determined from user input, updates its internal state, decides upon subsequent steps to continue a dialog, and provides output mainly as synthesized or recorded utterances. It has the following characteristics
Dialog Management receives recorded voice input from the IPA Service and forwards it to the ASR Dialog Management makes use of the TTS to generate audio data to be rendered on the IPA Client. As an extension, it may also provide commands as output to be executed by the IPA Client. As an extension Dialogs may also return multimodal output or text to be rendered by a respective modality synthesizer on the IPA Client.
For this, it employs several Dialogs that are responsible for handling isolated tasks or intents. The following types of dialogs exist:

Core Dialog Dialog X

The overall set of available Dialogs defines the behavior and capabilities of the interaction with the IPA. The Dialog Manager is also responsible for a good user experience across the available Dialogs. The Dialog Manager determines the Dialog that is best suited to serve the current user input and re-establishes the interaction state for that Dialog. Therefore, it may use the Dialog Registry.
The Dialog Manager follows the principle to fill in all slots that are known before prompting the user for it.The Dialog Manager also manages the session with a user. Conceptually, multiple sessions can be active in parallel. Dialogs are governed by Sessions, e.g. to free resources of ASR and NLU engines when a session expires. Linguistic phenomena, like anaphoric references and ellipsis, are expected to work within a Session. The selected IPA Provider or the Dialog Manager may have leading roles for this task.
The Dialog Manager also features an ASR to convert spoken utterances into text strings and a TTS to convert text strings into audio.

ASR

The Automated Speech Recognizer (ASR) receives audio streams of recorded utterances and generates a recognition hypothesis as text strings. Conceptually, ASR is a modality recognizer for speech. It has the following characteristics
Optionally, the ASR can generate multiple recognition hypotheses along with a confidence score.
Optionally, the ASR can be part of the IPA Provider. In this case, the received audio streams must be forwarded to the Provider Selection Service. In this case, the Core NLU must be part of an IPA Provider.
Multiple ASR instances may exist if multiple IPA Providers come with their own ASR In the case of a chat box, this component will not be needed.

TTS

The Text-to-Speech (TTS) component receives text strings, which it converts into audio data. Conceptually, the TTS is a modality-specific renderer for speech. It has the following characteristics.
Optionally, the TTS can also be part of the IPA Provider. In this case, the audio streams are retrieved from the Provider Selection Service.
In case the TTS is part of the IPA Provider, multiple TTS instances may exist. This may be useful in the case of branding.

Multiple TTS instances may exist in parallel. In this case, it is up to the current Dialog to specify the TTS engine to use.In the case of a chatbot, this component will not be needed.

Core Dialog

The Core Dialog can handle basic functionality via Core Intent Sets to enable interaction with the user. This includes among others

Greetings Goodbye

Exception handling in case a requested service is not available

Exception handling in case a requested intent cannot be matched to a known Dialog Help

Conceptually, the Core Dialog is a special Dialog as described in the following section that is always available

Dialog

A Dialog can handle functionality that can be added to the capabilities of the Dialog Management through their associated Intent Sets. The Dialogs must serve a different purpose in the sense that they are unique for a certain task. E.g., only a single flight reservation dialog may exist at a time. Dialogs have the following characteristics

Dialogs receive inputs as intents out of their supported Intent sets along with associated entities and return responses as text strings to be spoken. Dialogs reference all Intent Sets that they need to fulfill their service. Dialogs do not require the existence of a corresponding Intent Set. Dialogs may specify entities from an Intent Set that are filled after their execution. Dialogs may specify follow-up dialogs that are to be executed once the execution of this dialog is completed. Dialogs may specify clarification dialogs by name or by a list of entities from an Intent Set.

As an extension Dialogs may also return commands to be executed by the IPA Client.

As an extension Dialogs may also return multimodal output to be rendered by a respective modality synthesizer on the IPA Client.

Dialogs access the Provider Selection Service to fulfill their task. They maintain a state which they also share with the Dialog Management and know which IPA Provider evaluated their request with the help of an identifier.

A Dialog may specify a TTS engine to use in case there are multiple engines available.

Core Intent Sets

A Core Intent Set usually identifies tasks to be executed and defines the capabilities of the Core Dialog. Conceptually, the Core Intent Sets are Intent Sets that are always available.

Intent Sets

Intent Sets define actions along with their parameters that can be consumed by a corresponding Dialog and have the following characteristics

An Intent Set defines one or more intents with an optional number (including none) of entities to fulfill the corresponding action.

It abstracts from actual Intent Sets that are defined by the Intent Providers. In case the Intent Provider is identical to the platform provider, they may match.

It can be used in one or more Dialogs.

Dialog X

The Dialog X can handle functionality that can be added to the capabilities of the Dialog Manager through their associated Intent Set X. Dialog X extends the Core Dialogs and add functionality by custom Dialogs. The Dialog X's must serve different purposes in the sense that they are unique for a certain task. E.g., only a single flight reservation dialog may exist at a time. They have the same characteristics as a Dialog.

Intent Set X

An Intent Set X is a special Intent Set that identifies tasks that can be executed within the associated Dialog X.

Dialog Registry

The Dialog Registry manages all available Dialogs with their associated Intent Sets.

Dialogs and their Intent Sets can be added or removed as needed.

The Dialog Registry may notify Dialog Management if Dialogs have been added or removed.

The Dialog Registry may be queried by the Dialog Management for Intent Sets that are referenced in a Dialog.

The Dialog Registry may be queried by the Dialog Management for follow-up or clarification of Dialogs that are referenced in a Dialog by name or a list of entities from an Intent Set.

Intent Sets will be removed if no more Dialogs are referencing them. The Dialog Registry ensures that added Dialogs are unique

The Dialog Registry is not responsible to know about the counterparts in the APIs/Data Layer. The Dialog Registry notifies the Selection Service if Dialogs have been added or removed.

APIs/Data Layer

Provider Selection Service

A service that provides access to all known IPA Providers. This service also maps the IPA Intent Sets to the Intent Sets in the Dialog layer. It has the following characteristics

The Provider Selection Service receives input as text strings and returns results as intents with all recognized entities from all IPA Providers that can reply to the user input along with associated entities.

In case the Provider Selection Service is called with preselected IPA Providers only this one will be used.

IPA Provers and the Accounts/Authentication to access them and optionally ASR and TTS capabilities can be added or removed as needed.

The Provider Selection Service is stateless and always returns the responses from the used IPA Providers along with an identification of the issuing IPA Provider.

The Provider Selection Service makes use of the Accunts/Authentication to access IPA Provider.

The Provider Selection Services maps the Provider Intent Sets to the Intent Sets known by the Dialog Registry. The mapping must be configured when IPA Providers are added.

In case the ASR is bound to an IPA Providers the Provider Selection Service can consume audio stream and forward them to the available ASR engines.

Accounts/Authentication

A registry that knows how to access the known IPA Providers, i.e. which are available and credentials to access them. Storing of credentials must meet security and trust considerations that are expected from such a personalized service.

Core NLU

An NLU (Natural Language Understanding) component that can extract meaning as intents and associated entities from an utterance as text strings. It has the following characteristics

The Core NLU can handle basic functionality via Core Intent Sets to enable interaction with the user.

The Core NLU may make use of the Core Data Provider to access local or internal data or access external services.

Core Data Provider

A generic Data Provider to aid the Core NLU in determining the intent.

IPA Provider X

A provider of an IPA service, like

Google Assistant Amazon Alexa Microsoft Cortana SoundHound

The IPA provider may be part of the IPA implementation as an IPA Provider or a subset of the original functionality as described below as part of another IPA implementation.

Provider NLU

An NLU component that can extract meaning as intents and associated entities from an utterance as text strings for IPA Provider X. It has the following characteristics

The Provider NLU may make use of the Data Provider to access local or internal data or access external services.

The Provider NLU may make use of the Knowledge Graph to derive meaning.

Provider Intent Set

An Intent Set that might be returned by the Provider NLU to handle the capabilities of IPA Provider X.

Data Provider

A data provider to aid the Provider NLU in determining the intent. It has the following characteristics The Data Provider provides access to

- local data,
- external data or
- external services.

The Data Provider may be used to track the IPA Provider's state.

Knowledge Graph

A knowledge graph to reason about the detected input from the Provider NLU and Data Provider to come up with some more meaningful results.

7. EXTERNAL INTERFACE REQUIREMENTS

User interface requirement

Hardware, software, and robot requirements are listed below

Hardware interface system

Hardware requirements:

Any kind of internet connection like WIFI, modem data etcetera, to allow the browser interfaces to connect to the VSCode IDE.

- Processor: i5
- Hard Disk: minimum 329 GB
- RAM: minimum 5 GB

Hardware requirements for making the robot:

- Microcontroller
- Chassis
- Motors
- Motor Driver
- Wheels

8. SOFTWARE INTERFACE

The general architecture of IPAs described in this document should be detailed in subsequent documents. Further work must be done to

- specify the interfaces among the components
- suggest new standards where they are missing and may therefore
- refer to existing standards where applicable
- refer to existing standards as a starting point to be refined for the IPA case

Currently, the authors see the following situation at the time of writing

Component	Potentially related standards
IPA Client	(X)HTML
IPA Service	None
Dialog Management	Voice Extensible Markup Language (VoiceXML) 2.1

TTS	Web Speech API Speech Synthesis Markup Language (SSML) Version 1.0
ASR	Web Speech API Speech Recognition Grammar Specification Version 1.0
Core Dialog	None
Core Intent Set	None
Dialog Registry	Discovery & Registration of Multimodal Modality Components
Provider Selection Service	None
Accounts/Authentication	Web Authentication IDO Universal Authentication Framework
Core NLU	EMMA: Extensible MultiModal Annotation markup language Version 2.0
	JSON Representation of Semantic Information
Data Provider	None

The table above is not meant to be exhaustive, nor does it claim that the identified standards are suited for IPA implementations but must be analyzed in more detail in subsequent work. Most of them are a starting point for further refinement. For instance, the authors consider it unlikely that VoiceXML will be used in IPA implementations.

Out of scope of a possible standardization is the implementation inside the IPA Providers and a potential interoperability among them. However, it eases the integration of their exposed services or even allows them to use services across different providers. Actual IPA providers may make use of any upcoming standard to enhance their deployments as a marketplace of intelligent services.

FUTURE ENHANCEMENTS

From the future perspective, we would like to extend our designed robots in supermarkets to identify desired products for the customers. It is planned to implement in public places to suspect illegal activities, for navigation. Also, to be implemented in schools and colleges for attendance using face detection.

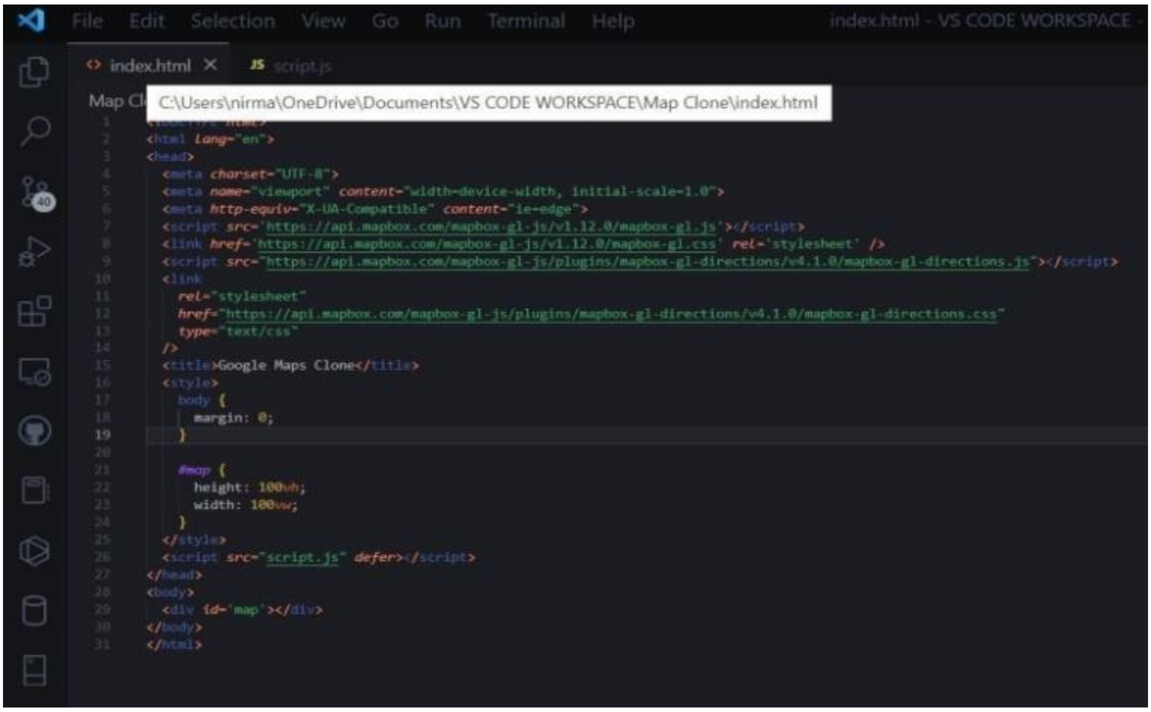
CONCLUSION

A combined human-robot system was motivated to enable autonomous operation. Requirements during service task specification, execution, and monitoring are achieved with the knowledge-based behavior provided by the operator using different MRI components. To achieve better human-robot communication an advanced system for natural spoken user-independent speech understanding has been integrated. Operator involvement during command generation guarantees flexible and safe operation. An animated 3D environmental model augmented by the image of an onboard CCD camera enables visual screen-based monitoring. Future research in our department is focused on the development of a communication system to supervise and teleoperate a remote semiautonomous service robot via the proposed MRI. This work systematically examined the robot assistance level, all highly relevant and interrelated factors for assisting humans to reach their desired places. This system helps humans to assist in the shortest place. The robot gets the input as speech from the humans. After the voice gets decoded, the robot started moving toward the location given by the human as the input. The designed robot can detect the obstacles on the way and acts according to them.

REFERENCES

1) J. Rasmussen, "Skills, rules, and knowledge; signals, signs, and symbols, and other distinctions in human performance models", IEEE 'Transactions on Systems, Man, and Cybernetics, vol. 13, no. 3, pp. 257-266, May June 2021.
2) K. M. Passino, “Intelligent control for autonomous systems”, IEEE Spectrum, pp. 55-62, June 2017.
3) R. A. Brooks, “A robust layered control system for a mobile robot”, IEEE Journal of Robotics and Automation, vol. 2, no. 1, pp. 14-23, March 2018.
4) G. Schmidt et al., “Special issue: Research on autonomous mobile robots”, Robotics and Autonomous Systems, vol. 14, no. 2-3, pp. 83-246, May 2020.
5) Y. Wen, J. Hu, and P. Pagilla, “A novel robotic system for finishing of freeform surfaces,” in Proc. Int. Conf. Robot. Automat. (ICRA), Montreal, QC, Canada, 2019, pp. 5571–5577, doi: 10.1109/ICRA.2019.8793734.
6) M. Buss C. Fischer and G. Schmidt, “Hierarchical supervisory control of service robot using human-robot- interface”, in Proceedings of the International Conference on Intelligent Robots and Systems (IROS), Osaka, Japan, 2019, pp. 4.-8. November.
7) H. Stahl, J. Muller, and M. Lang, “An efficient top-down parsing algorithm for understanding speech by using stochastic and semantic models”, in Proceedings of the International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Atlanta, USA, 2016, pp. 397-400.

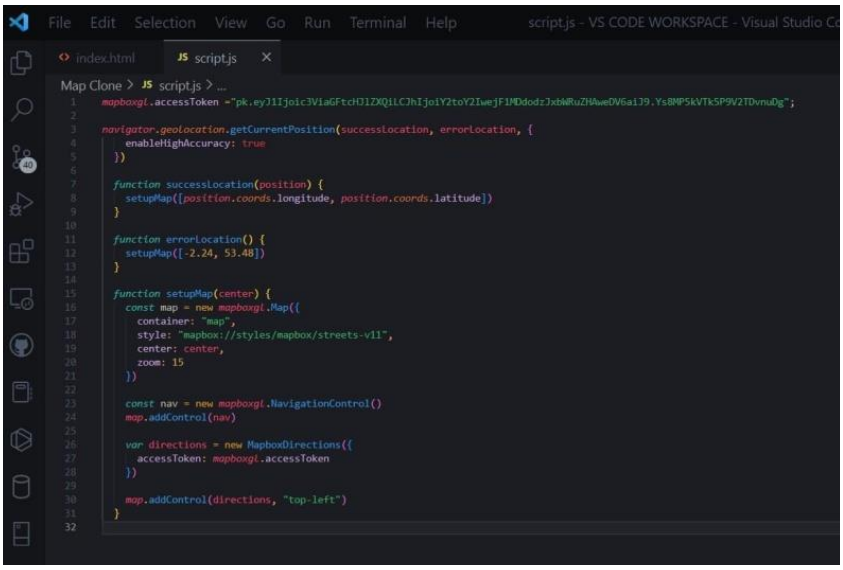
SAMPLE CODING



C:\Users\nirma\OneDrive\Documents\VS CODE WORKSPACE\Map Clone\index.html

```html
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <meta http-equiv="X-UA-Compatible" content="ie=edge">
  <script src='https://api.mapbox.com/mapbox-gl-js/v1.12.0/mapbox-gl.js'></script>
  <link href='https://api.mapbox.com/mapbox-gl-js/v1.12.0/mapbox-gl.css' rel='stylesheet' />
  <script src="https://api.mapbox.com/mapbox-gl-js/plugins/mapbox-gl-directions/v4.1.0/mapbox-gl-directions.js"></script>
  <link
    rel="stylesheet"
    href="https://api.mapbox.com/mapbox-gl-js/plugins/mapbox-gl-directions/v4.1.0/mapbox-gl-directions.css"
    type="text/css"
  />
  <title>Google Maps Clone</title>
  <style>
    body {
      margin: 0;
    }

    #map {
      height: 100vh;
      width: 100vw;
    }
  </style>
  <script src="script.js" defer></script>
</head>
<body>
  <div id='map'></div>
</body>
</html>
```

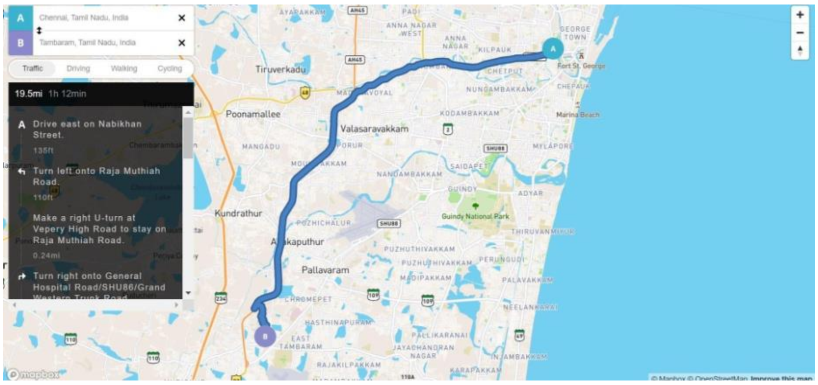
Fig -3: HTML File


File
Edit
Selection
View
Go
Run
Terminal
Help
script.js - VS CODE WORKSPACE - Visual Studio Co
index.html
script.js
Map Clone > script.js > ...
40

```
mapboxgl.accessToken ="pk.eyJ1IjoicC3ViaGFtcHJ1ZXQiLCJhIjoiY2toY2IwejF1MDdodzJxbWRuZHAweDV6aiJ9.Ys8MP5kVTk5P9V2TDvnuDg";

navigator.geolocation.getCurrentPosition(successLocation, errorLocation, {
    enableHighAccuracy: true
  })

  function successLocation(position) {
    setupMap([position.coords.longitude, position.coords.latitude])
  }

  function errorLocation() {
    setupMap([-2.24, 53.48])
  }

  function setupMap(center) {
    const map = new mapboxgl.Map({
      container: "map",
      style: "mapbox://styles/mapbox/streets-v11",
      center: center,
      zoom: 15
    })

    const nav = new mapboxgl.NavigationControl()
    map.addControl(nav)

    var directions = new MapboxDirections({
      accessToken: mapboxgl.accessToken
    })

    map.addControl(directions, "top-left")
  }
```

Fig 4: JavaScript File

SCREENSHOT



19.5mi 1h 12min

A Drive east on Nabikhan Street.
135ft

Turn left onto Raja Muthiah Road.
110ft

Make a right U-turn at Vepery High Road to stay on Raja Muthiah Road.
0.24mi

Turn right onto General Hospital Road/SHU86/Grand Western Trunk Road

Fig 5: Output