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Computer Science

NEA Coursework Projects

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**3.1 Analysis of the Problem:**

3.1.1 Problem Identification

1. **Description and justification of the features that make the problem solvable by computational methods.**

The problem that I am trying to solve is one to help my client (Luke) with productivity when he is working. He has a windows laptop and the voice assistant on there is something called Cortana. My client has found Cortana difficult and irritating to use as it is not up to the standards of Siri, a voice assistant apple has. As a result I need to make a virtual assistant which can take voice commands in, process them and then perform an action based on certain requests. As such I will need to allow for a voice input using a microphone, write an algorithm to work out what was said in the request made by the user and then perform an action. The voice assistant should be able to deal with a range of requests including calculations, sending emails, searching the internet and opening applications among other things. This should allow my client to increase the efficiency of his work.

1. **Explain why the problem is amenable to a computational approach.**

It is solvable by computational methods as the program that I am writing can perform a range of functions based on the users input quicker than a human can do these functions. This is a job for a computer as it can do many more things at one time than a human can. The process of inputting text into either an email or a web browser can be time consuming so having a computer to do it for you can reduce the amount of time you need to spend on it. The main way this problem is amenable to a computational approach is that it is trying to mimic a human. This means that you can ask it a question and it can think and produce an answer a lot quicker than a human brain can. This can lead to the human having less hassle and so allows the user to focus on the tasks that require more complicated thought than the mundane ones such as writing text into an email, something that a computer can do a lot more effectively. Decomposition can be used in order for mee to break the problem down into more manageable programable sections, this allows for programming the problem to be easier as I can just focus on small sections at a time, this means that I wont get side tracked by another part of the problem, this would also be partly abstraction as I am removing all unnecessary data from a problem in order to make It easier to solve.

Pattern recognition can also be used in order to look for similarities and patterns between parts of the problem. If I can identify a pattern within the problem this will make solving it a lot easier, if I know how to solve one part of the problem and identify that it is similar and has a pattern with another part of the problem then I can apply the same method of solving the problem to both sections with a bit of tweaking.

-There is no reference to any ‘specific’ computational approaches and how these link to making your problem solvable.

|  |  |
| --- | --- |
| Problem | How this is solvable by a computational approach |
| Existing programs not being easy to access | Have a keyboard shortcut to automatically make the program run |
| Spending unnecessary time on mundane and repetitive tasks | Having a computer automate these tasks for you by telling it what to do in speech and it performing the action |
| Existing program annoying my client | By tailoring my program specifically to the users needs I can reduce how irritating it can be to my client this can be done with decomposition to wok out what specifically annoyed my client as opposed to just thinking that the whole program annoys him |
| Doesn’t allow for a voice input | Allow for a voice input |
| No type of security in existing programs | Have a phrase that the computer needs to hear before allowing access to the program |

-This is a very short breakdown???

**3.2.1 Stakeholders:**

A stakeholder is a person who is not directly working on the program but someone who is affected by the outcomes of the project. Some examples are:

* My client will use the system to aid him in his daily life when working on his laptop. As a result how the program turns out has a massive impact on his work effectiveness. My client has not very much ICT competency and as a result the program needs to be simplistic and not requiring extensive computing knowledge to operate. They need the system to accomplish many different mundane tasks that are repetitive and if completed quickly allow for my client to speed up his work. My client has also warned me that a couple of his friends might be interested in it.
* My clients friends will also use this so it needs to be accessible for a wide range of people with ranging competency in relation to ICT skills. They will only use the finished product and may have a say in how it turns out, however I will not add another function to it if just one of them asks for it. They would also use it for the same purpose as my client, to speed up repetitive and mundane daily tasks on a computer.
* The public may also decide to use my program if my client decides that he likes my program enough to make it accessible to everyone so people can download it to their computers and use it. Their ICT competency will have to be assumed as a total beginner. I want the program to be able to be used by people who have no knowledge of computing at all. They will have no involvement in the new system or be involved with it in any way during the development stages. The only time when they would be able to interact with the program is when it goes public and then are able to download it.
* I am also a stakeholder in this project I am the developer and user of the system. In ICT and programming I have quite a lot of experience. I am not a beginner at using computer systems and so when I am developing the project I need to make sure that I don’t overcomplicate it and put in thing that I would find easy but someone that has no knowledge in the area would not be able to do. My needs for the new system are totally dependant on the clients requests, however I would like the program to be able to run without breaking, apart from that I have no other requirements of the system

-Are these the only stakeholders involved in your project?

-“Other members of the public” Who are they? How will this happen?

**3.1.2 research the problem:**

At the moment a similar solution to the problem exists on my clients computer, it is called Cortana however my client does not like it for a multitude of reasons. Foremost among them is that it is a pain to access. In order to access Cortana on his computer at the moment you need to enter the search bar, manually search for Cortana and then open the application, then you get the option to ask it a question by either typing or with your voice, however in order to ask it a verbal question you have to press another button to make it start listening to you. When you do get it to answer a question it only has a limited number of functions, none of which are very useful to my client. It can provide calendar and schedule assistance, meeting help, find information about people in your database, set alarms and reminders, get definitions and perform weather and news updates. It is also supposed to be able to open applications, as it says on the Microsoft support page(fig 1), however when testing out the functions of Cortana I found that it was unable to open applications(fig 2) Out of these my client uses none of them due to Cortana being difficult to open, and when you do open it you need to have the window open on the screen in order to use it, something that my client does not like as it draws attention away from the work that he is trying to do.

I will collect information about how the voice assistant should operate via use of a survey and a interview with my client and their assistant. These are good collection methods as the survey can provide me with a range of opinions form a large group of people, as such I can get the majority’s views on how it should look and what functions it should be able to perform. The interview I will conduct with my client and his secretary I will do this as the secretary has been briefed with my clients views on the topic and as he is not available for a while I will conduct a preliminary interview with the secretary in order to get a gist of what it should look like, then when I interview my client I will bring a prototype along with me in order to get his opinions on it so far, then I can change it according to his wishes.

Graphical user interface, application

Description automatically generatedFig 1

A picture containing background pattern

Description automatically generatedFig 2

Interview questions

1. Can you introduce yourself and your relation to my client.
2. What would you like this system to accomplish
3. Who will be using this system
4. What information does the system need to run
5. Do you want the software to have any particular layout
6. Do you want any documents and reports to be outputted, if so what?
7. Security, storage and backup?
8. What hardware and software will the users have available to them?
9. What would your intended audiences proficiency be at using computer

Interview answers

1. Can you introduce yourself and your relation to my client.

Hi, I am archie, I am a personal assistant to Luke. I have been working for him for many years.

1. What would you like this system to accomplish

It should be able to do calculations, perform mundane tasks such as opening applications when requested, perform web searches, send emails

1. Who will be using this system

I intend to use it to streamline my workflow, I may also then release it to the public

1. What information does the system need to run

It need a key binding or voice activation in order to commence the program

1. Do you want the software to have any particular layout

No I want it to run in the background without any user interface

1. Do you want any documents and reports to be outputted, if so what?

Not necessarily however I would like it to display the page on google if I ask it a question.

1. Security, storage and backup?

Yes, I want the data to be encrypted, I don’t want anything to be stored, backups not important as nothing is stored

1. What hardware and software will the users have available to them?

Laptops

1. What would your intended audiences proficiency be at using computer

I am quite proficient however the public may not be, so I would need it to be accessible to people with no prior knowledge of computers.

Analysis of the interview

From this interview I have learn many different thing about what the system should do, how it should look and who is operating it. All this information helps me to build a prototype, in this prototype it should be able to run autonomously without a GUI, it should be able to run on just a laptop with no external sources needed, my users proficiency at using computers is relatively unknown, it could range form a expert to a beginner so it must be easy to use. The prototype should be able to perform calculations, open apps and perform web searches. It should be helpful but not annoying.

Observation

Table

Description automatically generatedHaving heard all the criticism about Cortana from my client I decided to take a look at it myself, it has never been something that I have experimented with or even tried to use, however when looking at it in more detail I have found a number of things. Firstly how it displays data, when you are using the app it is partly self contained, it displays data in its window and rarely will do anything outside of its window, this can be annoying as in order to use it you would need to have the window open on screen, something that I find very annoying. For example if you were to ask it a simple calculation of 5 x 4 it would display it on its page (fig 3). When the see more button is pressed it opens up Bing with your search.

A lot of people are also interacting with the system, so it not being functional is a major flaw It also has quite a few problems, for a start not many of the function work on my computer, on the website it advertises it can look at meetings in your calendar (fig 4), however when looking at it in more depth I found that it will not be able to accomplish that function on mine. (fig 5)

Fig 4

Graphical user interface, application

Description automatically generated

Fig 5

A picture containing background pattern

Description automatically generated

Another problem with it is that it has one error message, if it does not understand something or can’t provide that function it just says “I’m sorry but I can’t help with that.” This is not very helpful as it does not provide the user with a definitive answer as to why their request was not able to be fulfilled. Under is another example of Cortana not working and providing the same error message, this time being asked to set an alarm.

A picture containing background pattern

Description automatically generatedGraphical user interface, text, application, chat or text message

Description automatically generated

After looking in detail about functionality of other solutions I have concluded that I need a variety of features I need in my program, I need it to be able to set alarms, open applications on the computer, perform calculation, have some sort of security for the new system, be able to send emails, have some sort of GUI and provide web searches.

In conclusion I found my research to be very beneficial to my understanding of the problem at hand, I can now see why my client will want a more improved and better version of Cortana. My task is to create a working and helpful voice assistant for my client, something that needs to be done in a manner as to not irritate him while still maintaining functionality. My research into other solutions that exist has taught me a multitude of things, foremost among them giving me new ideas that my project can incorporate such as an alarm, before this though I will have to run this past my client to make sure that he is alright with it.

-You lack any expansion of what appropriate features you could taking into your project.

Features of the new system

* Be controlled by voice, ie the user speaks to the computer and the computer performs an action based on it.
* Run autonomously in the background so as to not take attention away from data onscreen
* Be activated by a keyboard shortcut, (ctrl + 1 is the desired combination)
* Be able to open applications on the computer
* Be able to send emails
* Be able to perform web searches
* Be able to perform calculations
* Be able to identify what function needs to run based on the voice input

-These lack any descriptions and/or explanations, why does it need all of these, explanation on each, usability function,

Limitations of the new system

* I will not be able to allow for people that can’t speak as this would rewire to much time to allow for a typed input.
* The speech recognition system may also malfunction a little bit, it is not 100% accurate all the time and would take to long to account for each individual mispronunciation of words
* I have not tested if the system will be able to handle different accents, theoretically it should be able to but it depends how heavy the accent is.
* At this point I don’t know how to create alarms for a certain time in python either so more research will have to be carried out.
* I will not have time to test for every input that the program could be asked, so when it is released it may still not be able to account for some anomalies in the speech.

**3.1.4 Specify the proposed solution**

Software requirements:

First off lets start with the programming language that is needed for this. I will be programming in python as it is my most proficient language, it also has an easy way to open apps and other essential components of my program. It will also be easy to implement time into it as it has a built in function that allows to do this. This will be used for the alarm function on it. Python will be a good choice for me as I am already proficient in the language, it is easy to learn how to do new things and is relatively simple while still being able to conduct the functions that I want it to.

Another language that I may have gone for is Visual Basic. I started on this language a couple of years ago however found it long winded, for example, in order to output a line in python the syntax is “print” in Visual Basic however it is “console.writeline”. There is also less help online about Visual Basic as it is a less common language than python is.

Overall I am inclined to go with python as I am more proficient in it, it has less unnecessarily long syntaxes, which will help with debugging as the code is more concise and so easier to read. And I already know that it has the modules in it which would allow it to accommodate to my needs.

-Consider types of software to operate the system – what software is needed to operate the system, linex or windows, why

Hardware requirements:

For hardware requirements I will need a windows based laptop. Fortunately my laptop is a Microsoft surface pro which looks like this:

My laptop also has a mouse and keyboard along with in build storage. There is enough storage to store multiple files of code. Python would also need to be downloaded onto the computer in order to program it. A microphone and speaker will also be needed, my laptop has this inbuilt.

The users will need a laptop or computer with a keyboard as well with enough storage for the python file, they will also need some sort of microphone and speakers to allow for the program to give verbal answers and to also receive verbal instructions from the user.

I could program this on the school computers, the also have an inbuilt microphone and speaker so would fit the requirements of the program. However these computers are bad for a couple of reasons, foremost is their my inability to access command prompt. This would mean that I am unable to install modules onto the computer making this program very hard if not impossible. If I were to use these computers I would need to install these modules onto the school system, meaning that they would be downloaded onto every computer and as a result would take a very long time and a lot of storage space, none of which are a good thing. Another reason why the school computers would not be the preferable for utility is that I would only be able to program this solution when I am at school, this would drastically limit the time I could spend on the program meaning that I would have way less time to program extra parts into it.

All of this hardware is required is so that the program can run. Without the speakers the program can’t speak back at you meaning that you are essentially taking to a brick wall. The microphone is necessary as it allows for a user input. Arguably this is the most important part as you can’t have a voice activated program if there is no way for the voice to be heard by the computer.

This program could also run on a iPad with a keyboard attached to it. They have a built in microphone so would allow for the voice input and with a keyboard attached the key combination could be pressed to start the program.

It could not run on phone as it does not have the capability to accept a keyboard input of crtl+1

-Consider other types of hardware whereby this kind of program could run on.

**Success criteria**

General success criteria

* The program must be able to register a voice input. This will be tested by me programming a short program that when it hears a voice input will output whatever was said.
* It must be able to run autonomously in the background when not needed, waiting until the keyboard shortcut is pressed, this will be tested by making the program wait until I press a button for it to output something so I know it has worked
* The program must have a voice output in order to let the user know that it is registering the input, if it encounters any errors it should let the user know by speaking to them.
* It must be able to open applications on the computer at the users request, this was specified by the user in their interview. This means that it needs to know what apps are on the computer and from the string of words inputted find the application
* It must be able to send an email as specified in the interview. This means that it needs to be able to input a email address into who to send it to it must then enter a subject of the email then it should write the main paragraph of the email. This will all have to be done with the python file interacting with outlook.
* The program must be able to set alarms for a specified period of time. At the moment I don’t know how to do this, one way that I could is to just ask the user for a time in hours and minutes, then convert them into second and use the inbuilt time.sleep function however this would end up pausing the whole program for that amount of time, which is useless. One way to circumvent this would be to use multiple threads inside my program, this I am unsure how to do though. More research into this field is needed.
* The program has to be able to perform web searches. This will be done by opening a web browser and then inputting the string that the computer is asked to find an answer for.

Design useability success criteria:

My program does not have a lot of design features as it is mostly going to run in the background.

* A GUI will be incorporated into the program at my clients request, he wants it to appear in the top left of the screen, it will be 200 x 300 pixels.
* My client also wants it to be slightly see through. This will be done by effecting the alpha value of the window.

Input useability success criteria

* The user can ask a question through voice input, with a microphone
* The user can ask any question to the program, this includes facts and other information. The computer will handle the request and then if it is not one of its functions will perform a web search for it.
* The program needs to be able to accept an input of words and numbers in one string and perform either a calculation or set a timer for a certain amount of time.
* All of these will be tested by using the program

Output useability success criteria

* There will be a visual output of a GUI, still unsure what should be on the GUI, this needs to be determined with my client at a later date.
* Audible output will be the main output of the program, the aim is to have the program working fully through voice with the GUI just being a auxiliary function of the program.
* There will be no motion output
* They will be tested by using the program to see if I get the expected output.

Processing functionality and robustness success criteria

* This needs to be finished

Testing about success criteria, how its testing, what type of testing,

Graphical user interface, text, application, email

Description automatically generated

**Design**

Decomposition

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Voice controlled smart assistant for laptops | | | | | | | | | | |
| Interacting with the user | | | | | | ABack end processes | | | | |
| Voice control (this is an essential pat of the voice controlled smart assistant as without the voice controlled it doesn’t really provide the functionality that my client wants) | | | Voice identification (this allows the computer to identify who it is speaking and so will allow for more sophisticated password entry system | | Speak back at the user | Databases | | functions of the smart assistant | | |
| Listening to the person (we have to get the computer to know when the user wants it to listen otherwise it will just pick up everything that is said, this can be done through a key combination ) | Converting speech to text (using the google speech api for this task as making my own will be far to time consuming and probably wont work as well) | Do something based on the text (an action will need to be called in this case a series of if statements will check to see what the human is trying to say. | Password entry system (listens to the user say a phrase, compares the phrase to a stored password on the computer and also analysis the voice data of the person to see if it’s the same person speaking | This allows for different users to be introduced with their own data and name, as such the program can address anyone by name | this lets the user know what the program is doing and if the user needs to do anything | Storing the name, password and the voice data of the user if creating a new account (this allows us to identify who everyone is when thy try to log in | Accessing data from the database this is needed in order to work out who is actually speaking by accessing the data stored in the database | Calculations, the program needs to be able to do 4 different calculations, add, subtract, divide, multiply | Email, the program will need to be able to create an email in order to provide more functionality | Lock, the program will be able to lock the computer if asked for |
| Key combination (will be ctrl + 1 this starts the program ) |  |  |  | |  |  | | | | |
|  |  |  |  | |  |  | | | | |

A diagram of a flowchart

Description automatically generated with low confidence

Basic functionality of the program. This is how the main program will run. It will wait for a keyboard input of ctlr + 1 then it will listen for the speech from the users. Then the speech will be broken down into text and stored in a variable which is then analysed by the algorithm to understand if it will need to run a specific function which provides a function of the application

FUNCTION recognition():

# Defines a new function for speech recognition

window.wm\_state('normal')

r = createRecognizer() # Create a new instance for speech recognition

WITH microphone as source: # Set the microphone as the audio source

GLOBAL compare

r.adjust\_for\_ambient\_noise(source) # Adjust for ambient noise

speak("I'm listening") # Speak the phrase "I'm listening"

audio = r.listen(source, timeout=5) # Record a phrase and store it in 'audio'

compare = r.recognize\_google(audio) # Store the recognized speech in 'compare'

IF "open" in compare:

PRINT compare # Output the recognized speech

runopen() # Call the function runopen()

ELSE IF "x" in compare:

multiply() # Call the function multiply()

ELSE IF "/" in compare:

divide() # Call the function divide()

ELSE IF "+" in compare:

add() # Call the function add()

ELSE IF "-" in compare:

subtract() # Call the function subtract()

ELSE IF "email" in compare:

email() # Call the function email()

ELSE IF "lock" in compare AND "computer" in compare:

lock() # Call the function lock()

ELSE:

kt.search(compare) # Perform a Google search for the value in 'compare'

speak("Here is what I found on the web") # Speak the phrase "Here is what I found on the web"

A picture containing text, diagram, line, receipt

Description automatically generated

This is how the computer knows what the user is asking it to do and it will run a function based on what the user askes it to do.

IF "open" in compare:

PRINT compare # Output the recognized speech

runopen() # Call the function runopen()

ELSE IF "x" in compare:

multiply() # Call the function multiply()

ELSE IF "/" in compare:

divide() # Call the function divide()

ELSE IF "+" in compare:

add() # Call the function add()

ELSE IF "-" in compare:

subtract() # Call the function subtract()

ELSE IF "email" in compare:

email() # Call the function email()

ELSE IF "lock" in compare AND "computer" in compare:

lock() # Call the function lock()

ELSE:

Search() # calls function search()

END FUNCTION

A diagram of a computer

Description automatically generated with low confidence

Shows the function of opening apps on the computer. The requested application to be opened is extracted from the users spoken text. This is then compared to a list of known applications on the computer and if it finds the application it will open it up for you. If it can’t find the application it wont try to open any app.

words = compare.split() # Splitting the string into a list of words

endwords = words[-2] # Store the second to last word in 'endwords'

endwords = endwords + words[-1] # Append the last word to 'endwords'

endword = words[-1] # Store the last word in 'endword'

open(str(endwords), match\_closest=True, output=False) # Try to open an app with the name of 'endwords'

speak("Opening " + str(endword)) # Speak the phrase "Opening" followed by 'endword'

tk.Label(window, text="You said: ").grid(column=0, row=3) # Add a label to the window

tk.Label(window, text=compare).grid(column=1, row=3) # Add text to the window

A picture containing text, diagram, screenshot, line

Description automatically generated

The multiply function will take 2 numbers from the users speech. It does this by working out where the index positions of the two numbers are, storing them in a variable each and then multiplying the variables together to give a number. In this case it does not matter which order the numbers are in as it would give the same result e.g. 5 x 3 and 3 x 5 are both 15

GLOBAL compare

mystring = compare # Assign the value of 'compare' to 'mystring'

index = mystring.index("x") # Get the index position of 'x'

num1 = "" # Initialize 'num1' as an empty string

num2 = "" # Initialize 'num2' as an empty string

backdone = False # Set 'backdone' to False

frontdone = False # Set 'frontdone' to False

index = index - 2 # Subtract 2 from 'index'

WHILE (NOT backdone) AND index >= 0:

IF mystring[index].isdigit(): # Check if the character at 'index' is a digit

num1 = mystring[index] + num1 # Concatenate the digit to 'num1'

ELSE:

backdone = True # Set 'backdone' to True to exit the loop

index -= 1 # Decrement 'index' by 1

index = mystring.index("x") # Get the index position of 'x' again

index = index + 2 # Add 2 to 'index'

WHILE (NOT frontdone) AND index < len(mystring):

IF mystring[index].isdigit(): # Check if the character at 'index' is a digit

num2 = num2 + mystring[index] # Concatenate the digit to 'num2'

ELSE:

frontdone = True # Set 'frontdone' to True to exit the loop

index += 1 # Increment 'index' by 1

answer = int(num1) \* int(num2) # Perform the multiplication

speak("The answer is " + str(answer)) # Speak the phrase "The answer is" followed by 'answer'

A picture containing text, screenshot, diagram, line

Description automatically generated

The add function will take 2 numbers from the users text. It does this by working out where the index positions of the two numbers are, storing them in a variable and then adding the variables together to give a number. This is the same as the multiply function in the sense that it does not matter which order the numbers are in, it will give the same result.

FUNCTION add():

# Defines the function add

mystring = compare

index = mystring.index("+")

num1 = "" # Initialize 'num1' as an empty string

num2 = "" # Initialize 'num2' as an empty string

backdone = False # Set 'backdone' to False

frontdone = False # Set 'frontdone' to False

index = index - 2 # Subtract 2 from 'index'

WHILE (NOT backdone) AND index >= 0:

IF mystring[index].isdigit(): # Check if the character at 'index' is a digit

num1 = mystring[index] + num1 # Concatenate the digit to 'num1'

ELSE:

backdone = True # Set 'backdone' to True to exit the loop

index -= 1 # Decrement 'index' by 1

index = mystring.index("+") # Get the index position of '+' again

index = index + 2 # Add 2 to 'index'

WHILE (NOT frontdone) AND index < len(mystring):

IF mystring[index].isdigit(): # Check if the character at 'index' is a digit

num2 = num2 + mystring[index] # Concatenate the digit to 'num2'

ELSE:

frontdone = True # Set 'frontdone' to True to exit the loop

index += 1 # Increment 'index' by 1

answer = int(num1) + int(num2) # Perform the addition

speak("The answer is " + str(answer)) # Speak the phrase "The answer is" followed by 'answer'

END FUNCTION

A picture containing text, diagram, line, screenshot

Description automatically generated

This function subtracts two numbers from each other. It takes the two numbers given from the users text and stores them in variables. Then it subtracts the variables from each other. This is slightly different however as it requires the numbers to be in the correct order as 5 – 3 and 3 – 5 give completely different answers. The program will take the number with the smallest index value and store it in the first variable. The number with the larger index value will be stored in the second variable and the second variable will be taken away from the first variable.

FUNCTION subtract():

# Defines the function subtract

mystring = compare

index = mystring.index("-")

num1 = "" # Initialize 'num1' as an empty string

num2 = "" # Initialize 'num2' as an empty string

backdone = False # Set 'backdone' to False

frontdone = False # Set 'frontdone' to False

index = index - 2 # Subtract 2 from 'index'

WHILE (NOT backdone) AND index >= 0:

IF mystring[index].isdigit(): # Check if the character at 'index' is a digit

num1 = mystring[index] + num1 # Concatenate the digit to 'num1'

ELSE:

backdone = True # Set 'backdone' to True to exit the loop

index -= 1 # Decrement 'index' by 1

index = mystring.index("-") # Get the index position of '-' again

index = index + 2 # Add 2 to 'index'

WHILE (NOT frontdone) AND index < len(mystring):

IF mystring[index].isdigit(): # Check if the character at 'index' is a digit

num2 = num2 + mystring[index] # Concatenate the digit to 'num2'

ELSE:

frontdone = True # Set 'frontdone' to True to exit the loop

index += 1 # Increment 'index' by 1

answer = int(num1) - int(num2) # Perform the subtraction

speak("The answer is " + str(answer)) # Speak the phrase "The answer is" followed by 'answer'

END FUNCTION

A diagram of a function

Description automatically generated with low confidence

This function divides two numbers. It extracts them from the text in the same way as the other functions. Then orders them into their separate variables which is then divided. The first variable would be divided by the second variable.

FUNCTION divide():

# Defines the function divide

mystring = compare

index = mystring.index("/")

num1 = "" # Initialize 'num1' as an empty string

num2 = "" # Initialize 'num2' as an empty string

backdone = False # Set 'backdone' to False

frontdone = False # Set 'frontdone' to False

index = index - 2 # Subtract 2 from 'index'

WHILE (NOT backdone) AND index >= 0:

IF mystring[index].isdigit(): # Check if the character at 'index' is a digit

num1 = mystring[index] + num1 # Concatenate the digit to 'num1'

ELSE:

backdone = True # Set 'backdone' to True to exit the loop

index -= 1 # Decrement 'index' by 1

index = mystring.index("/") # Get the index position of '/' again

index = index + 2 # Add 2 to 'index'

WHILE (NOT frontdone) AND index < len(mystring):

IF mystring[index].isdigit(): # Check if the character at 'index' is a digit

num2 = num2 + mystring[index] # Concatenate the digit to 'num2'

ELSE:

frontdone = True # Set 'frontdone' to True to exit the loop

index += 1 # Increment 'index' by 1

answer = int(num1) / int(num2) # Perform the division

speak("The answer is " + str(answer)) # Speak the phrase "The answer is" followed by 'answer'

END FUNCTION

A picture containing text, diagram, screenshot, parallel

Description automatically generated

This function composes emails for you. It first starts of with identifying that you want it to send an email. It does this by looking at key words within the users request. Then it calls the function email which first, connects to outlook, then it creates a new template of an email, then it asks the user by voice what they want the subject of the email to be. This is stored in a variable and then set to the subject of the email. Then the program asks who the email should be sent to. It is not the best with @ symbols as it hears emailexample **at** gmail.com this is a problem as it won’t actually send to a correct email address and so the user needs to check it. Then it asks what should be in the main body of the email

FUNCTION email():

ol = win32com.client.Dispatch("outlook.application")

olmailitem = 0x0 # Size of the new email

newmail = ol.CreateItem(olmailitem) # Create a new email

# Asking for the subject of the email

r = sr.Recognizer() # Create a new instance of speech recognition

WITH sr.Microphone() AS source: # Set the microphone as the audio source

global subject

r.adjust\_for\_ambient\_noise(source) # Adjust for ambient noise

speak("What would you like the subject of the email to be?")

audio = r.listen(source) # Record the phrase

subject = r.recognize\_google(audio) # Convert speech to text

newmail.Subject = subject # Set the subject of the email

# Asking for the recipient of the email

r = sr.Recognizer() # Create a new instance of speech recognition

WITH sr.Microphone() AS source: # Set the microphone as the audio source

r.adjust\_for\_ambient\_noise(source) # Adjust for ambient noise

speak("Who would you like to send the email to?")

audio = r.listen(source) # Record the phrase

send = r.recognize\_google(audio) # Convert speech to text

newmail.To = send # Set the recipient of the email

# Asking for the main body of the email

r = sr.Recognizer() # Create a new instance of speech recognition

WITH sr.Microphone() AS source: # Set the microphone as the audio source

r.adjust\_for\_ambient\_noise(source) # Adjust for ambient noise

speak("What would you like to say in the email?")

audio = r.listen(source, timeout=10) # Record the phrase with a timeout of 10 seconds

body = r.recognize\_google(audio) # Convert speech to text

newmail.Body = body # Set the body of the email

speak("Email created. Please check to make sure I understood everything correctly, especially the email address of the receiver.")

newmail.Display() # Display the new email on the screen

END FUNCTION

A picture containing text, diagram, line, font

Description automatically generated

The computer is locked by running this line of code, ctypes.windll.user32.LockWorkStation(). This line of code uses the ctypes module to accesss the windows API function ‘LockWorkStation()

import ctypes

def lock():

ctypes.windll.user32.LockWorkStation()

A picture containing text, diagram, screenshot, line

Description automatically generated

This function searches the web for users inputted text then displayes the web page on screen

function search():

performGoogleSearch(compare)

speak("Here is what I found on the web.")

waitForSpeechToFinish()

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Algorithm | Part of algorithm | Input | Action/outputted result | Works? Y/N |
| Recognition | Ctrl+1 press | Ctrl+1 keyboard input | A gui will pop up | Yes |
| Recognition | Adjust for ambient noise | n/a | n/a | Yes |
| Recognition | Speak to the user | n/a | Spoken text | Yes |
| Recognition | Listening for voice input | Spoken text | n/a | Yes |
| Recognition | Store voice in variable called compare | Spoken text | n/a | Yes |
| Recognition | Identifying which function is called | Variable compare | calling a fucntion | Yes |
| Open | Splitting the string and storing it in endword | n/a | Stored in a variable | Yes |
| Open | Identifying the closest application | Variable Compare | Opening a application | Yes |
| add | Finding index of + | Variable mystring | Stored in a variable called index | Yes |
| add | Setting backdone and frontdone to false | n/a | Set them to false | Yes |
| Add | Backdone | Variable index and variable mystring | Integers stored in variable | Yes |
| Add | frontdone | Variable index and variable mystring | Integers stored in a variable | Yes |
| add | calculation | 2 integers as variables | 1 integer | Yes |
| Subtract | Backdone | Variable index and variable mystring | Integers stored in variable | Yes |
| Subtract | frontdone | Variable index and variable mystring | Integers stored in a variable | Yes |