Proceedings of the International Conference on Intelligent Computing and Control Systems (ICICCS 2020)
IEEE Xplore Part Number:CFP20K74-ART; ISBN: 978-1-7281-4876-2

An Autonomous Diet Recommendation Bot Using Intelligent Automation

Prithvi Vasireddy
Dept. Of Computer Science
V. R. Siddartha Engineering College

Abstract— Robotic process automation(RPA) and intelligent automation have been replacing manual automation across various industries due to their significant ROI(return on investment). While Artificial intelligence is a simulation of the cognitive approach, RPA is merely mimicking that process by the use of bots. RPA and IA are emerging and transforming businesses across various sectors such as finance and accounting, payroll, human resources, supply chain, customer service, sales and marketing, IT etc.[5] **One such industry where bots are being used for automating processes is the food and lifestyle industry. Various applications like healthify me and room suggest users a diet based on their specifications like height, weight, age, gender etc. Some of these applications make use of E-mail automation to suggest users with a user-specific, specially curated diet at timed intervals(daily/weekly/monthly..). Various tools such as Automation Anywhere, Blue prism, UI-Path, Pega etc.**[4] **are used to create bots and automate tasks/compute algorithms. The tool used for the creation of this diet recommendation system is Automation Anywhere. By making use of automation anywhere, a recommender system is created that can act as a meal planner. There are three types of bots in Automation Anywhere – task bots, meta bots and IQ bots. Task bots need to be edited manually with application updates. Metabots on the other hand, are more advanced. They are designed in such a way that bot-recalibration is automatically applied with changes in the application interface. IQ bots use cognitive technology when working with unstructured data**[11]. **Here, For this particular application, taskbots and metabots are used. The proposed solution is capable of sending a large number of diet recommendations to hundreds of users in a database at a very expeditious rate.**

Keywords— RPA, IA, ROI, manual automation, Automation Anywhere, task bots, meta bots, IQ bots, E-mail automation

INTRODUCTION

Bot-creation can be done using a variety of tools. One such tool that is widely used for robotic process automation is Automation Anywhere. By using the various features of Automation Anywhere, we can automate tasks for a large number of users effectively at a very swift pace. A diet recommendation engine needs to calculate the macros and calorific needs based on user data. This can be done by collecting user input and making use of quadratic equations to automate the process of suggesting a diet at a specified time interval. Automation Anywhere consists of a control room and a client application. The control room is where a user with admin privileges handles the bots by scheduling and maintaining them[12]. The client is where the programmer, or in this case, a task-bot/meta-bot designer designs the bot. Here, meta-bots/ task- bots made used for object-cloning, SQL query processing and E-mail automation to create a 'diet-recommendation bot'.

PROPOSED SOLUTION

The proposed methodology makes use of a food database with information on macros and calories collected from MyFitnessPal[1]. The object-cloning and metabot logic have been constructed on a calorie/macro calculator [2] through the input from a user database. Based on the output of calories and macros, a user specific diet is recommended via E-mail. The bot is then scheduled to perform this task at a specified time interval(as indicated/set by the control room administrator). This way, diet recommendation can be performed efficiently on a large number of users with very little effort. With the proposed solution, a recommender system can be created that could be used as a back-end procedure for a lifestyle application that recommends/suggests users a healthy, balanced diet like a virtual dietician.

METHODOLOGY

Control Room:

The control room is an interface that manages and monitors all processes in the RPA infrastructure[6]. Upon log in, to schedule bots, click on 'bots > my bots > Schedule bot'. In this section, choose the task bot to be scheduled. the bot is scheduled to run at a specific time/time interval by choosing 'run repeatedly > every 'x' days > start date > end date >

repeat every > end time' options. To access the bots section of the control room the user must have access to the 'run my bots' privilege i.e, the bot runner license.

Object-Cloning:

As the name suggests, object-cloning makes use of a technique where objects are captured in web-browsers to run a task. The recommended browser for object-cloning is internet explorer due to its stability. Object-cloning makes use of coordinates to capture various objects like check-boxes and text-boxes in HTML, Java, and Flex technologies[7]. Object-cloning can be performed effectively only when the display is reduced to the recommended setting of '100%' on both the device and the browser**.**

Variable Operations:

The variable operations command is made use to assign variables to their respective values (e.g. To assign the values in the age column of the excel sheet to the age variable i.e. $ExcelColumn(3)$ to age). Mathematical operations can also be performed within the variable operations command by computing a variable with another variable/set of variables**.**

Eg.

(var_1) + (var_2) + (var_3) to var_4

(var_1/var_2) to (var_3)

Database Command:

The environment used here to manage the SQL server, databases and infrastructure is Microsoft SSMS (SQL Server management studio). The DB connectivity is established by connecting it to the OLE-DB(object linking and embedding- database) provider for ODBC(open database connectivity) drivers. The required SQL query can then be executed and the output can be generated. The output is then exported to a .csv file. A stored procedure can also be called.

Metabots:

One of main advantages of a metabot is its ability to perform tasks offline. By simply recording the page and capturing the GUI component, a task can be edited without the access to live application. Another advantage of a metabot is its ability to recalibrate and eliminate navigational errors when the application is updated. A metabot consists of two units – Assets and Logic[8]. The assets unit displays the recorded screens and the logic unit is a functional unit that displays the navigational flow. A metabot can be created separately in the Metabots section of the client and be called in the task-bot.

Taskbots:

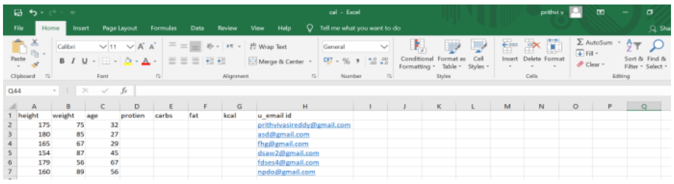
Taskbots are used to automate rule based repetitive tasks on structured data[9]. Unlike metabots, they can only be used online. Also, when an application undergoes changes or is updated, the task designed using the taskbot has to be edited. The navigational flow(logic) on the taskbot can be designed using a recorder/object cloning.

E-mail Automation:

E-mail automation can be done by making use of the 'send-email' command. The bot-creator can send attachments in .txt, .csv or in an embedded HTML format. Variables consisting contents of the email/e-mail ids can be inserted as variables to send email to multiple users at a single flow.

IMPLEMENTATION

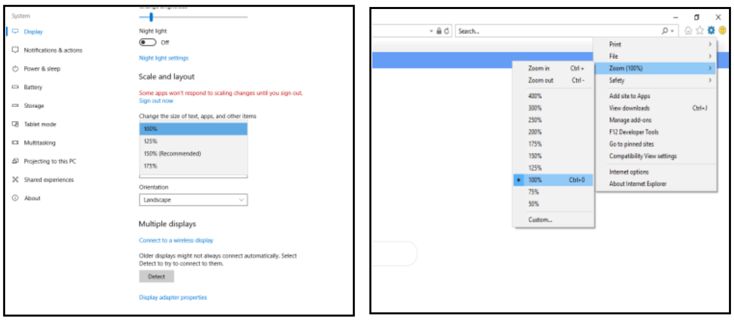
Step(1): Fig[1.1] consists of an excel sheet with user information(user-database). It consists of existing information of a user i.e, height, weight, age, and email-id. Using this information the macros and calorific requirements of each user is calculated individually.



	A	B	C	D	E	F	G	H
1	height	weight	age	protien	carbs	fat	kcal	u_email id
2	175	75	32					prithvivasireddy@gmail.com
3	180	85	27					asd@gmail.com
4	165	67	29					fhg@gmail.com
5	154	87	45					dsaw2@gmail.com
6	179	56	67					fdses4@gmail.com
7	160	89	56					npdo@gmail.com

Fig[1.1] – user information

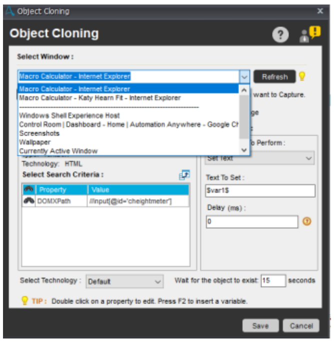
Step(2): When creating a task-bot that makes use of object-cloning/web-recorders, it is highly recommended to reduce both the system display and browser display settings to 100% as shown in Fig[1.2] and Fig[1.3]. This is to ensure capturing of objects/elements without any issues. The most widely used browser for automation across various platforms is the internet explorer due to its stability.



Fig[1.2] and Fig[1.3] Display settings for object cloning

Step(3): Upon this, the object-cloning command is selected from the list of commands and the web-page choose to clone is selected from the drop-down menu as shown in Fig[1.4] . A macro and calorie calculator [2] has been cloned to derive the required output of the user. However, this can also be performed manually by assigning variables with their respective variable operations by using these formulas[3] . The

'$counter$ +1' function must be used when automating multiple users.[10]



Object Cloning

Select Window : Macro Calculator - Internet Explorer

Macro Calculator - Internet Explorer
Macro Calculator - Katy Hearn Fit - Internet Explorer
Windows Shell Experience Host
Control Room | Dashboard - Home | Automation Anywhere - Google Ch
Screenshots
Wallpaper
Currently Active Window

Technology: HTML

Select Search Criteria :

Property	Value
DOMXPath	//input[@id='cheightmeter']

Set Text

Text To Set : $var1$

Delay (ms) : 0

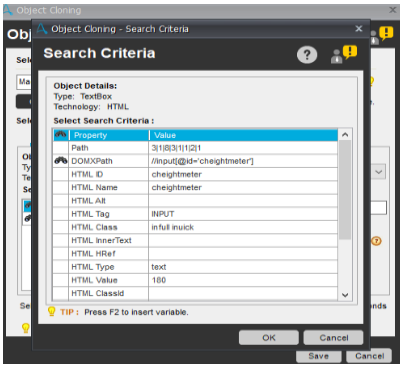
Select Technology : Default

Wait for the object to exist 15 seconds

TIP : Double click on a property to edit. Press F2 to insert a variable.

Fig[1.4]choosing the window to be cloned

Step(4): The specific object to be cloned or in this case, the text-box for height is selected and properties can be enabled/disabled as shown in Fig[1.5] by clicking on the binocular icon on the left hand side of each property as shown below:



Object Cloning - Search Criteria

Search Criteria

Object Details:
Type: TextBox
Technology: HTML

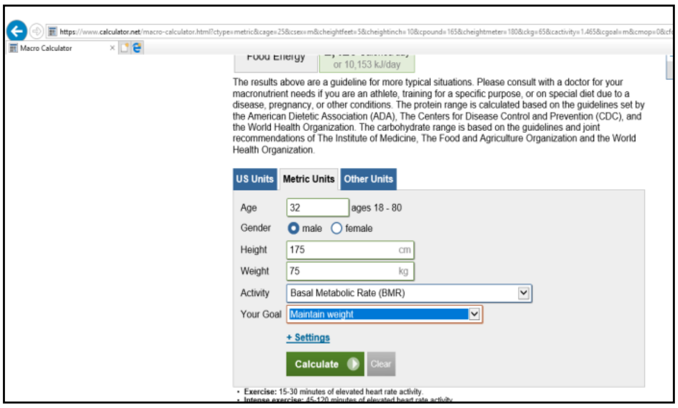
Select Search Criteria :

Property	Value
Path	3|1|8|3|1|1|2|1
DOMXPath	//input[@id='cheightmeter']
HTML ID	cheightmeter
HTML Name	cheightmeter
HTML Alt	
HTML Tag	INPUT
HTML Class	infull inuick
HTML InnerText	
HTML HRef	
HTML Type	text
HTML Value	180
HTML ClassId	

TIP : Press F2 to insert variable.

Fig[1.5] Search Criteria

Fig[1.6] shows the object-cloning process of importing the data from the excel sheet to the respective text boxes and other operations on check boxes, drop-down menus etc



https://www.calculator.net/macro-calculator.html?ctype=metric&cage=25&csex=m&cheightfeet=5&cheightinch=10&cpound=165&cheightmeter=180&ckg=65&cactivity=1.465&cgoal=m&cmop=0&cf

Macro Calculator

Food Energy or 10,153 kJ/day

The results above are a guideline for more typical situations. Please consult with a doctor for your macronutrient needs if you are an athlete, training for a specific purpose, or on special diet due to a disease, pregnancy, or other conditions. The protein range is calculated based on the guidelines set by the American Dietetic Association (ADA), The Centers for Disease Control and Prevention (CDC), and the World Health Organization. The carbohydrate range is based on the guidelines and joint recommendations of The Institute of Medicine, The Food and Agriculture Organization and the World Health Organization.

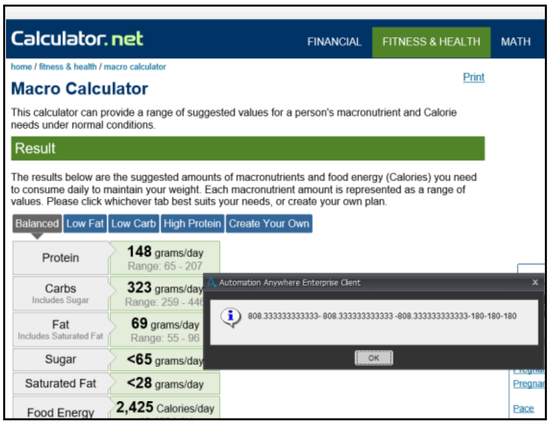
US Units | Metric Units | Other Units

Age: 32 ages 18 - 80
Gender: ● male ○ female
Height: 175 cm
Weight: 75 kg
Activity: Basal Metabolic Rate (BMR)
Your Goal: Maintain weight

- Exercise: 15-30 minutes of elevated heart rate activity.
- Intense exercise: 45-120 minutes of elevated heart rate activity.

Fig[1.6] Object Cloning Process

The macros and calorific requirements of the user are calculated and the splitting up of calorific needs and macros as protein, fat and carbohydrate requirement is done for three meals as shown in Fig[1.7]. Based on the user requirement the number of meals can be increased/decreased and the variable operation can be adjusted



home / fitness & health / macro calculator

Macro Calculator

This calculator can provide a range of suggested values for a person's macronutrient and Calorie needs under normal conditions.

Result

The results below are the suggested amounts of macronutrients and food energy (Calories) you need to consume daily to maintain your weight. Each macronutrient amount is represented as a range of values. Please click whichever tab best suits your needs, or create your own plan.

Balanced | Low Fat | Low Carb | High Protein | Create Your Own

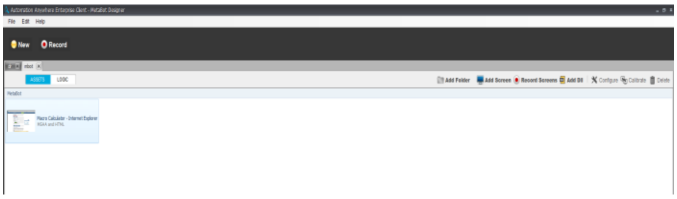
Protein	148 grams/day Range: 65 - 207
Carbs Includes Sugar	323 grams/day Range: 259 - 446
Fat Includes Saturated Fat	69 grams/day Range: 55 - 96
Sugar	<65 grams/day
Saturated Fat	<28 grams/day
Food Energy	2,425 Calories/day

Automation Anywhere Enterprise Client

808.333333333333- 808.333333333333 -808.333333333333-180-180-180

Fig[1.7] spltting up of macros and calories

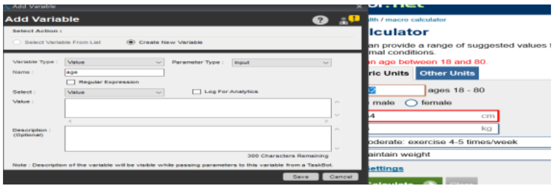
Step(4.1) – Alternative: Object-cloning is performed when using a taskbot for automation. One of the main drawbacks of taskbots is that when an application undergoes changes or is updated from the time when the bot was created, the taskbot logic needs to be edited simultaneously. To overcome this problem, a metabot can be made used. A metabot comprises of two units – the assets and logic. The screen and logic(navigational flow) to be added can be added by clicking on 'add screen' and 'add logic' buttons as seen in Fig[1.8] and Fig[1.9]. In metabots, the screen can be captured and the editing can be done offline unlike taskbots that require an internet connection.



Fig[1.8]

Fig[1.9]

Step(4.2): Unlike taskbots, in metabots, during variable declaration parameter type has to be specified(input/output/inputoutput) as shown in Fig[2.0]



Add Variable

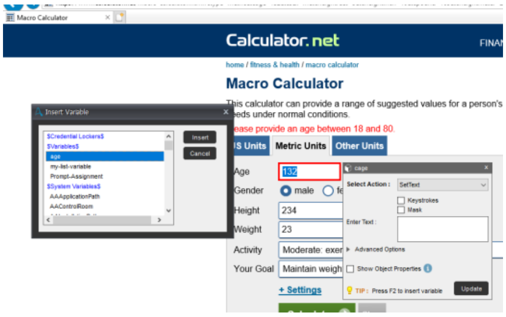
Select Action : ○ Select Variable From List ● Create New Variable

Variable Type : Value
Parameter Type : Input
Name : age
□ Regular Expression
Select : Value
□ Log For Analytics
Value :
Description : (Optional)
300 Characters Remaining

Note : Description of the variable will be visible while passing parameters to this variable from a TaskBot.

Fig [2.0]

Step(4.3): The user defined variable can then be set to each object on the application individually as shown in Fig[2.1]


Macro Calculator

Insert Variable: $Credential Lockers$, $Variables$, age, my-list-variable, Prompt-Assignment, $System Variables$, AAApplicationPath, AAControlRoom

Age: 132 · Gender: ● male ○ fe · Height: 234 · Weight: 23 · Activity: Moderate: exer · Your Goal: Maintain weigh

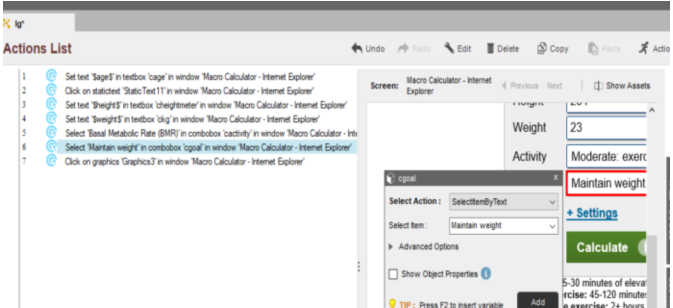
cage — Select Action : SetText; □ Keystrokes; □ Mask; Enter Text :; □ Show Object Properties

TIP : Press F2 to insert variable

Calculator.net
FINAN
home / fitness & health / macro calculator
Macro Calculator
This calculator can provide a range of suggested values for a person's needs under normal conditions.
ease provide an age between 18 and 80.
S Units
Metric Units
Other Units
Insert
Cancel
Advanced Options
+ Settings
Update

Fig[2.1]

The actions performed on the application are stored as a navigational procedure in the logic unit of the metabot. The flow of actions such as SelectItemByText, set text, click etc. is designed here .


Actions List

1 Set text 'age' in textbox 'cage' in window 'Macro Calculator - Internet Explorer'
2 Click on statictext 'StaticText11' in window 'Macro Calculator - Internet Explorer'
3 Set text '$height$' in textbox 'cheightmeter' in window 'Macro Calculator - Internet Explorer'
4 Set text '$weight$' in textbox 'ckg' in window 'Macro Calculator - Internet Explorer'
5 Select 'Basal Metabolic Rate (BMR)' in combobox 'cactivity' in window 'Macro Calculator - Inte
6 Select 'Maintain weight' in combobox 'cgoal' in window 'Macro Calculator - Internet Explorer'
7 Click on graphics 'Graphics3' in window 'Macro Calculator - Internet Explorer'

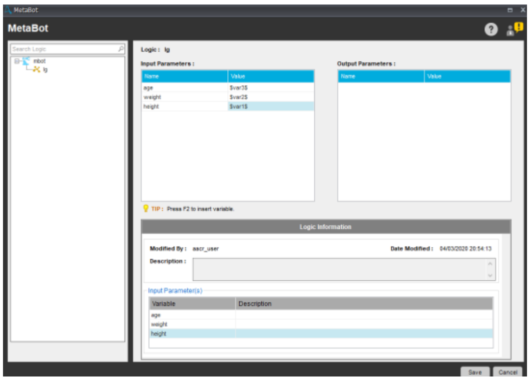
Screen: Macro Calculator - Internet Explorer

cgoal — Select Action : SelectItemByText; Select Item : Maintain weight; □ Show Object Properties

TIP : Press F2 to insert variable

Fig[2.2] Navigational flow the of logic unit

Step(4.4) : Now, from the workbench, the metabot is called and in the logic unit, the variable values are declared as shown in Fig[2.3]. The values can either be assigned through a user specified value or a previously declared variable.


MetaBot

Logic : lg

Input Parameters :

Name	Value
age	$var3$
weight	$var2$
height	$var1$

Output Parameters :

Name	Value

TIP : Press F2 to insert variable.

Logic Information

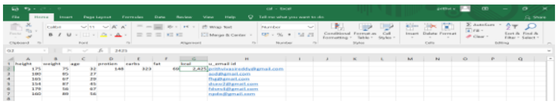
Modified By : aacr_user   Date Modified : 04/03/2020 20:54:13

Description :

Input Parameter(s)

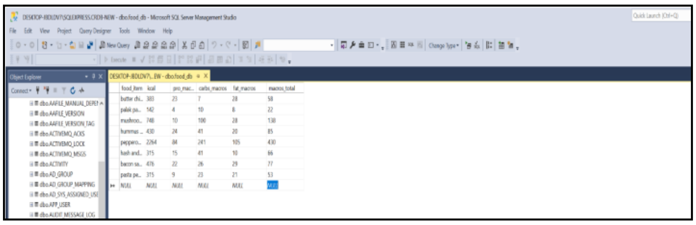
Variable	Description
age	
weight	
height	

Fig[2.3]



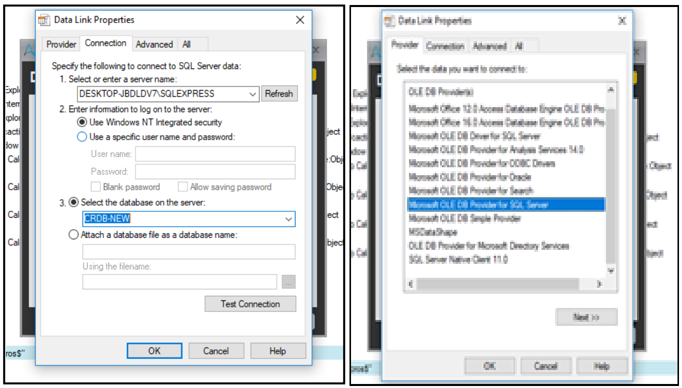
Fig[2.4]

Step(5): Once the actions are performed on either the metabot/taskbot(object cloning), the excel sheet of the user database(fig[1.1]) is automatically updated.



Fig[2.5] food database on ssms

Step(6): When an SQL query needs to be processed for the intended result, an environment like SSMS is made used. The database connectivity can be established and the task can be performed using the database command on the task bot. In the database command of automation anywhere, a database and a server that establishes connection to the SQL server data is chosen as
shown in Fig[2.6]. In the following step as shown in Fig[2.7], a DB provider such as Microsoft OLE DB Provider For SQL Server is chosen. The connection between the server, database and the provider is then tested. Upon successful connection, The SQL query can be entered to retrieve the required result. This result can then be exported to a .csv file by assigning a variable that consists of the path where the query result is to be exported as shown in Fig[3.0] and Fig[3.1].


Data Link Properties

Provider | Connection | Advanced | All

Specify the following to connect to SQL Server data:

1. Select or enter a server name: DESKTOP-JBDLDV7\SQLEXPRESS
2. Enter information to log on to the server:
   ● Use Windows NT Integrated security
   ○ Use a specific user name and password:
   User name:
   Password:
   □ Blank password □ Allow saving password
3. ● Select the database on the server: CRDB-NEW
   ○ Attach a database file as a database name:
   Using the filename:

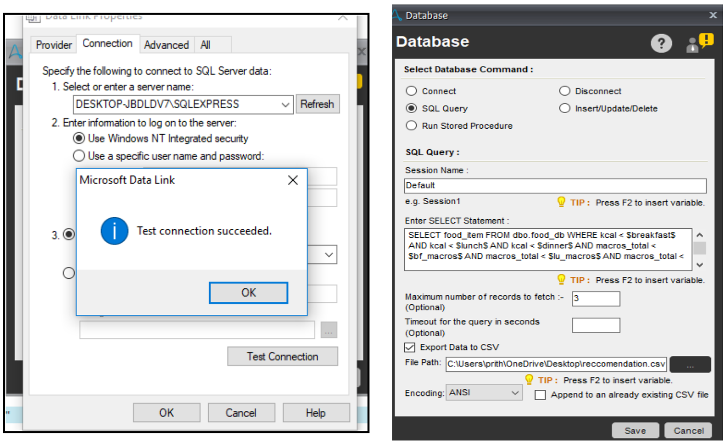
Data Link Properties

Provider | Connection | Advanced | All

Select the data you want to connect to:

OLE DB Provider(s)
Microsoft Office 12.0 Access Database Engine OLE DB Pro
Microsoft Office 16.0 Access Database Engine OLE DB Pro
Microsoft OLE DB Driver for SQL Server
Microsoft OLE DB Provider for Analysis Services 14.0
Microsoft OLE DB Provider for ODBC Drivers
Microsoft OLE DB Provider for Oracle
Microsoft OLE DB Provider for Search
Microsoft OLE DB Provider for SQL Server
Microsoft OLE DB Simple Provider
MSDataShape
OLE DB Provider for Microsoft Directory Services
SQL Server Native Client 11.0

Fig[2.6] and Fig[2.7]


Data Link Properties

Provider | Connection | Advanced | All

Specify the following to connect to SQL Server data:

1. Select or enter a server name: DESKTOP-JBDLDV7\SQLEXPRESS
2. Enter information to log on to the server:
   ● Use Windows NT Integrated security
   ○ Use a specific user name and password:

Microsoft Data Link

Test connection succeeded.

Database

Select Database Command :

○ Connect ○ Disconnect
● SQL Query ○ Insert/Update/Delete
○ Run Stored Procedure

SQL Query :

Session Name : Default

e.g. Session1   TIP : Press F2 to insert variable.

Enter SELECT Statement :

```
SELECT food_item FROM dbo.food_db WHERE kcal < $breakfast$
AND kcal < $lunch$ AND kcal < $dinner$ AND macros_total <
$bf_macros$ AND macros_total < $lu_macros$ AND macros_total <
```

TIP : Press F2 to insert variable.

Maximum number of records to fetch :- (Optional) 3

Timeout for the query in seconds (Optional)

☑ Export Data to CSV

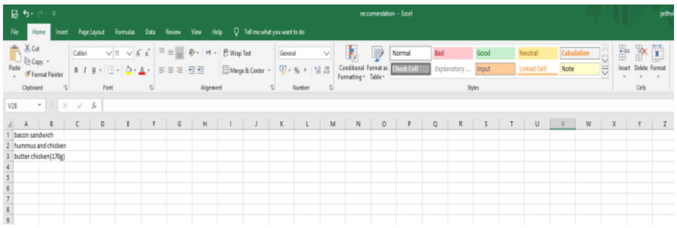
File Path: C:\Users\prith\OneDrive\Desktop\reccomendation.csv

TIP : Press F2 to insert variable.

Encoding: ANSI   □ Append to an already existing CSV file

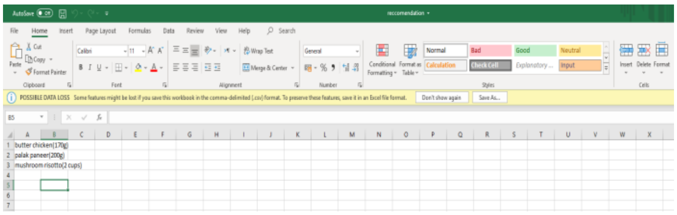
Fig[2.8] and Fig[2.9] : Connection Testing & SQL Query Processing

In the database command, a database and a server that establishes connection to the SQL server data is chosen as shown in Fig[2.6]. In the following step, as shown in Fig[2.7], a DB provider such as Microsoft OLE DB Provider For SQL Server is chosen. The connection between the server, database and the provider is then tested as shown in fig[2.8]. Upon successful connection, The SQL query can be entered to retrieve the required result. This result can then be exported to a .csv file by assigning a variable that consists of the path where the query result is to be exported as shown in Fig[2.9] Fig[3.0] and Fig[3.1] show the results of the query for two different users under two test-cases.



	A
1	bacon sandwich
2	hummus and chicken
3	butter chicken(170g)

Fig[3.0]

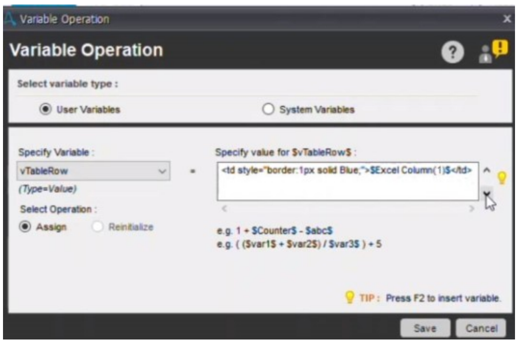


POSSIBLE DATA LOSS Some features might be lost if you save this workbook in the comma-delimited (.csv) format. To preserve these features, save it in an Excel file format.

	A
1	butter chicken(170g)
2	palak paneer(200g)
3	mushroom risotto(2 cups)

Fig[3.1]

Step(7): To send this result in the form of a HTML table to the user email-id's in Fig[1.1], a variable 'vTableRow' is created and assigned the values of Excel column(1) of Fig[3.1] using variable operations as shown in Fig[3.2].



Variable Operation

Select variable type : ● User Variables ○ System Variables

Specify Variable : vTableRow (Type=Value)

Specify value for $vTableRow$: `<td style="border:1px solid Blue;">$Excel Column(1)$</td>`

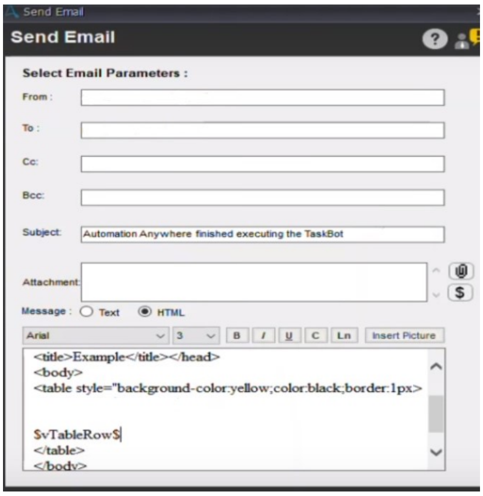
Select Operation : ● Assign ○ Reinitialize

e.g. 1 + $Counter$ - abc
e.g. (($var1$ + $var2$) / $var3$) + 5

TIP : Press F2 to insert variable.

Fig[3.2]

Step(8): Using the Send E-mail Command, the 'vTableRow' variable is attached in the HTML body of the message and Send it to the intended user. To successfully send an e-mail, a connection must be established with a specified E-mail server. To establish connection with a server : Tools > Options > E-mail settings.



Send Email

Select Email Parameters :

From :
To :
Cc :
Bcc :
Subject: Automation Anywhere finished executing the TaskBot
Attachment:
Message : ○ Text ● HTML

```
<title>Example</title></head>
<body>
<table style="background-color:yellow;color:black;border:1px>

$vTableRow$
</table>
</body>
```

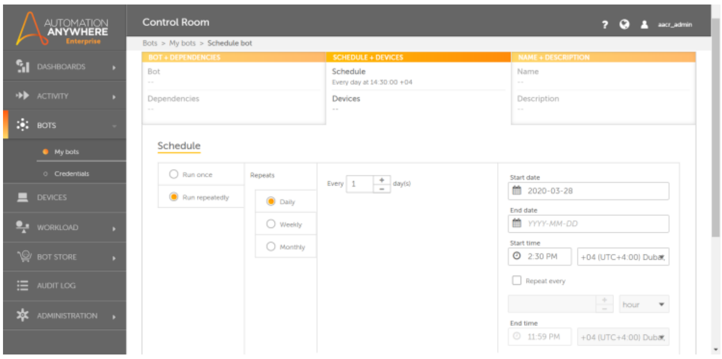
Fig. [3.3] Send E-mail command

The Processed query/user recommendation is then sent to the e-mail id of the user.

The step-by-step implementation of all the steps as seen above in detail via taskbot and metabot are as shown below:

Link:
https://docs.google.com/document/d/1UZnCe7XyAnc21NYGlK2bV9JXV80xrTDis0ZhXZDt-Zs/edit?usp=sharing

Step(10): This process can be scheduled and maintained as required from the control room as shown in Fig[3.5]. To schedule this bot, upon login:
bots > my bots > Schedule bot.



Control Room

Bots > My bots > Schedule bot

BOT + DEPENDENCIES: Bot --; Dependencies --

SCHEDULE + DEVICES: Schedule Every day at 14:30:00 +04; Devices --

NAME + DESCRIPTION: Name --; Description --

Schedule

○ Run once ● Run repeatedly

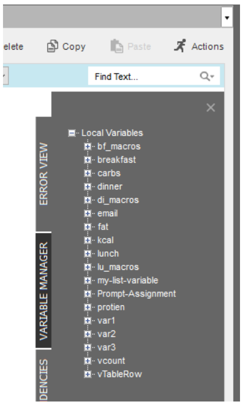
Repeats: ● Daily ○ Weekly ○ Monthly

Every 1 day(s)

Start date 2020-03-28
End date YYYY-MM-DD
Start time 2:30 PM +04 (UTC+4:00) Dubai
□ Repeat every hour
End time 11:59 PM +04 (UTC+4:00) Dubai

Fig[3.5] Schedule bot Section of the control room

Fig[3.6] consists of all the variables used in the bot. The values assigned to each of these variables and their working(variable operations) can be seen in the link provided in the results section.



Fig[3.6]

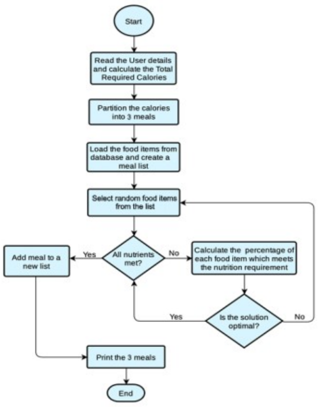

Start
Read the User details and calculate the Total Required Calories
Partition the calories into 3 meals
Load the food items from database and create a meal list
Select random food items from the list
All nutrients met?
Yes
Add meal to a new list
No
Calculate the percentage of each food item which meets the nutrition requirement
Is the solution optimal?
Yes
No
Print the 3 meals
End

Fig. [3.7] Navigational Flow of logic

RESULTS

Input1	Input2	Input3	Output1	Output2	Output3	Outpu4	Recommendation
height	weight	age	Protien	carbs	fat	calories	items
175	75	32	148	323	69	2425	Butter chicken(170g) , palak paneer(200g), mushroom risotto
180	85	27	165	360	77	2703	Bacon sandwich, Hummus and chicken, Butter chicken(170g)

Fig. Performance analysis table for two test cases from user database and food database(fig[1.2] and fig[2.5])

The SQL query that processes the result from the food database in Fig[2.5] is :

```
SELECT food_item FROM dbo.food_db WHERE
kcal < $breakfast$ AND kcal < $lunch$ AND kcal
< $dinner$ AND macros_total < $bf_macros$ AND
macros_total < $lu_macros$ AND macros_total <
$di_macros$ ORDER BY RAND()
```

The number of records to be retrieved for this bot have been limited to 3. The variable operations and the number of records to be returned can be tuned as per our need. Task-bots are effective most of the time. However, when there is a necessity to work-offline or the application to be cloned keeps updating/makes changes often, a metabot can be called from the task bot. Metabots can handle changes. This can save a lot of time for the bot creator and can ensure the smooth running of the bot at any given time without any hassle. This way based on user information like height, weight etc, a bot can be designed to recommend a user a balanced diet via his/her email. The e-mail of the food item recommendation sent to the user's mail-id can be seen in the link below –
Link:
https://docs.google.com/document/d/1UZnCe7XyAnc21NYGlK2bV9JXV80xrTDis0ZhXZDt-Zs/edit?usp=sharing

CONCLUSION

The target of the project is to create an autonomous bot that could recommend users a healthy diet based on their specifics like height, weight etc. By collecting user data, a diet recommendation bot on automation is created anywhere that is cost-effective and works at a very fast pace with low-maintenance. This bot can further be improved by maintaining a more curated database for each meal and suggesting users food as a basis of breakfast, lunch and dinner. Meal planning can be very complex. However, by adding additional equations besides macros and calorific needs(like balancing of vitamins and minerals), higher precision is achieved and a more effective meal recommendation as compared to an 'actual' human dietician. This way, an efficient, robust, cost-effective model is created.

REFERENCES

[1]www.myfitnesspal.com
[2]https://www.calculator.net/macro-calculator.html
[3]https://www.healthline.com/nutrition/how-to-count-macros#step- by-step
[4] https://medium.com/datadriveninvestor/top-10-most-popular-rpa-tools-of-2019-8b022252de1
[5] https://blog.aimultiple.com/robotic-process-automation-use-cases/
[6] https://docs.automationanywhere.com/bundle/enterprise-v11.3/page/enterprise/topics/control-room/getting-started/control-room-overview.html
[7] https://docs.automationanywhere.com/bundle/enterprise-v11.3/page/enterprise/topics/aae-client/bot-creator/commands/object-cloning-command.html
[8] https://www.edureka.co/blog/automation-anywhere-bots/#MetaBots
[9] https://www.edureka.co/blog/automation-anywhere-bots/#Task%20Bots
[10] https://docs.automationanywhere.com/bundle/enterprise-v11.3/page/enterprise/topics/aae-client/bot-creator/using-variables/how-to-use-array-variable-in-loop-command.html
[11]https://www.automationanywhere.com/images/products/IQBotBrochure.pdf
[12] https://docs.automationanywhere.com/bundle/enterprise-v11.3/page/enterprise/topics/control-room/bots/my-bots/run-a-bot.html