Birla Institute of Technology and Science, Pilani
Hyderabad Campus

CS F407 Artificial Intelligence, II-Semester 2021-2022

Assignment No: 1 Date of Submission: 20/03/20022

Q.1 In this assignment, you will create a messenger bot using C++/ Java/ Python/AIML etc. which can provide intelligent dialog conversations with the user, similar to ELIZA or ALEXA discussed in the class. An example conversation is as shown below:

User: Hi, my name is Raj.

Bot: Hi Raj, how are you?

User: I am fine.

Bot: Good to know that.

User: Do you know any nearby eateries in BITS Hyderabad?

Bot: I can let you know some.

User: No I don't want.

Bot: Why is that?

User: I am not hungry.

Bot: Are you telling you are not hungry?

User: Yes.

Bot: But you wanted to know about places to eat in BITS Hyderabad?

The messenger bot has to use a knowledgebase with multiple random responses exchanged between the user and the bot. The bot should be able to give replies to multiple interactions and should be able to store the conversations in a database/knowledgebase. The knowledgebase can be stored using MySQL, SQLlite or in any other flat file. The bot should also be able to interact with web services and help the user with multiple tasks which might be in the form of knowing the weather (Forecast.io API or any open source API), etc. The interactions with the web services have to be created using RESTful services (you can use Flask or any other API you like). The bot should also be able to recommend you good eateries within the BITS, Hyderabad campus. Create your own corpus for recommending such eateries. You may use Artificial Intelligence Markup Language (AIML) for creating the core of the Chabot. The frontend may be an Android app developed by you for this purpose. No machine learning is to be used and the whole assignment would be based on keyword matching and intent recognition. If you want to use a CLI for interacting with your Chabot, you can do so.

Q.2 A dart board is filled with 12 sectors. Each sector can perform 4 operations, rotate clockwise, rotate anticlockwise, shift down (till center). Given an initial state (Fig. A), design and implement an efficient heuristic approach to reach the goal state (Fig B). Use **Steepest Ascent Hill-Climbing Search** with an appropriate heuristic evaluation function. During the execution, you may check if your heuristic evaluation function is prone to issues like local maxima, plateau or ridges as discussed in the class. You need not provide any solution to these problems at this stage.

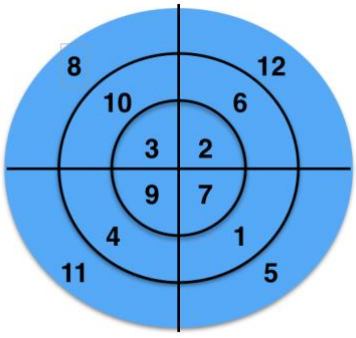


FIG-A (initial state)

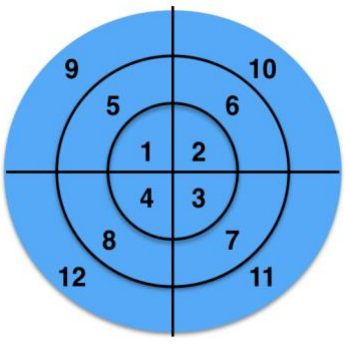
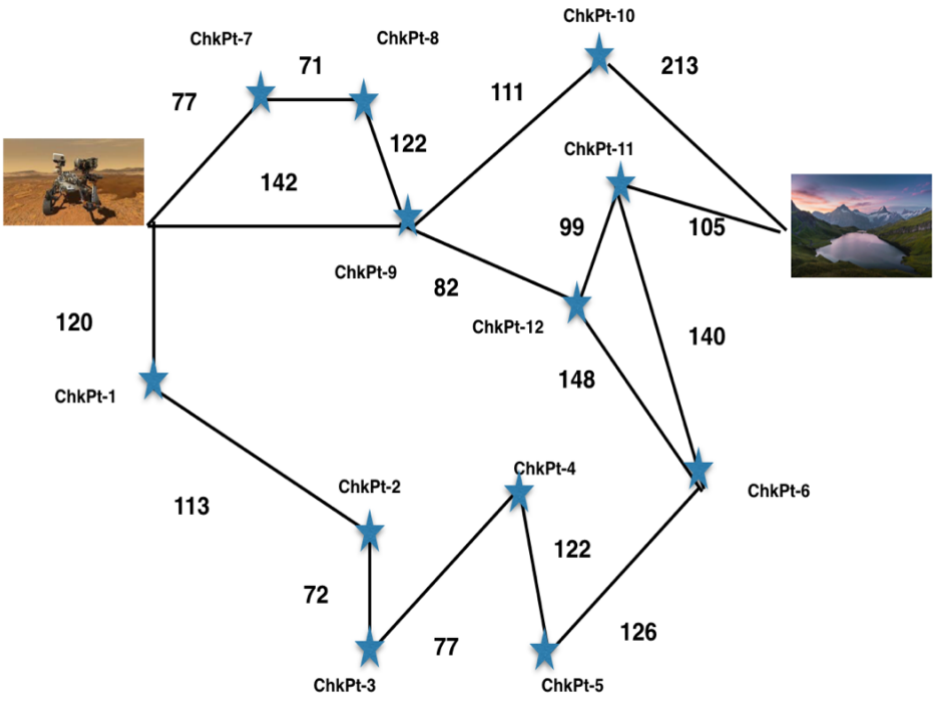


FIG-B (goal state)

Notes:

1. While performing the jump operation (shift down), the numbers will be swapped. For example in FIG A, if 4 jumps to 9, the values in these positions will be swapped
2. For your convenience the first two steps are as below:
    a. JUMP(4) : will result in swapping 4 with 9
    b. C_ROTATE(9): will rotate the sector containing 9 by one step in clockwise direction.
    c. A_ROTATE(9): will rotate the sector containing 9 by one step in anticlockwise
3. It is possible that the input combination may not end up in the goal state also. This should be reflected in the output
4. If the combination exists for the given input, the sequence of steps need to be printed.

Q.3 In 2021, a Mars rover, Perseverance, landed on the moon carrying along with it the first of its kind helicopter named Ingenuity. The goal of the rover was to travel to the center of a crater named Jezero with the help of Ingenuity. Since no help from Earth is available, Perseverance is solely dependent on Ingenuity's inputs. Ingenuity flies across a couple of meters and gives an aerial topography as an input to Perseverance (FIG A) and based on these inputs the rover takes its next step. Design a communication channel between Ingenuity and Perseverance where the copter sends the expanded states from the initial position of the rover, the rover sends back the decision it takes on the expanded states and so on. Ensure that an optimal heuristic approach search (A*) is used by the rover to decide upon which state to choose. The edges in the topography represent the distances between each check point.



Submission Instructions: You may form your own group of maximum three students. You can choose any language of your choice and also design the interface (i.e. the way you will interact with your application) suitably. Name your files using your ID Nos, like 2018A7001.cpp, 2018A7002.cpp, 2018A7003.cpp etc. Send your source code (which will be used later to run during the demo slot) through the below google form. Submissions from a group can be made from one student of the group. However, in the google form you should fill the details of your group mates. Each group can submit once through the form using BITS email ID.

Submit through:

https://docs.google.com/forms/d/e/1FAIpQLSevnNjhssSdMH1JQITwDDNYlC0PRib490mz32UBNsnHRhgjGw/viewform

Date Given: 20th Feb 2022.
