INDIAN INSTITUTE OF TECHNOLOGY
KHARAGPUR
KSHITIJ 2013

ROBOTIX
TECHNOLOGY ROBOTIX SOCIETY

MARAUDER'S MAP

INTRODUCTION

Category of Event: **Online Coding (does not require presence at Kharagpur)**

You are a marauder looking for new areas to explore, invade and plunder. Your ultimate aim, of course, is to end your campaign with maximum profit. You are given a map of the world, and the money you'll earn by looting various cities on it. However, the terrain between these cities is rough, and some paths are easier to travel on, although longer. Some modes of transport are cheap, others fast. Write a program that can chalk out your itinerary, making you as rich as possible.

PROBLEM STATEMENT

Design and Implement an algorithm that can maximize profit as a Marauder travels in different maps comprising different terrains and vehicles to travel.

TASK

The participant's code should be able to**:**

1. Read the map and segment it into different regions
2. Calculate the path you must take to maximize your profit, given the money earned by looting different cities, and the costs associated with travelling.

It is not necessary to loot all cities. Ideally, a city should be raided only if the cost to travel to it is less than the money gained by looting it.

RULES AND SPECIFICATIONS

GENERAL RULES

- A team can have a maximum of 3 members, none of which can form a separate team for the event.
- Code should be written in any language but the output should only be the text file in given format.
- Code should be sent as a zip file with proper instructions on how to compile and run it on different maps on *marauder's_map@robotix.in*.
- The decision of the organizing team will be final.
- Round One is not a qualifying round but cumulative scores of both rounds will be taken.
- Every participant needs to make two different codes for each round and the scores of each round will be added to get the final score.
- Sample input images and files and the Evaluator will be uploaded soon.
- Running time should be realistic and any running time of more than 3 sec will be disqualified.
- Last date of submission for **First Round is 24 Jaunuary and Second Round is 28 Jan 2013.**
- Tie breakers will be resolved on the basis of minimum running time.
- Final Input images/files will also be uploaded at the time of the fest.

EVENT RULES

1. Image provided will always have a fixed resolution of 800x600.
2. The text file provided will always have the same format.
3. Movement is allowed only in straight lines through cities in first round and any path made up of straight lines in second round.
4. Each city can be visited only once in both rounds though visiting all cities is not necessary.
5. Only one mode of transport can be used at a time and by default the mode is on foot.
6. The program should also specify when to stop else team will be disqualified.

ROUNDS

ROUND 1

- The participant's code will be tested against a number of maps with different configurations.
- **The** Black Spot is the starting point.
- Each map is divided into a number of differently colored regions.

- Each region has a certain number of cities denoted by colored rectangles.
- The invader can only travel in straight lines between cities.
- The invader earns money by looting cities and loses it by hiring vehicles and using fuel.
- Hiring vehicles changes the Distance Scaling Factor(D) by multiplying it with the factor given in the input text file with each vehicle.
- Each map has its own legend giving all information about the color coding and money earned/lost by various actions.
- Each map can be looted/visited only once.
- Cost of travelling will be calculated using Bresenham Line Drawing algorithm to find pixels on straight lines in image.

The following information will be given in legend:

- Number of regions
- Number of cities
- Initial Points (X)
- Travel Cost Factor for each region. (Different regions have different terrain and hence the ease of travelling varies. The invader loses money proportional to this factor while traversing that particular region)
- Money earned on looting each city
- No of vehicles in city.
- Money lost by hiring a particular vehicle from a city for the journey to the next city
- Distance Scaling Factor (Translates pixel distance to real distance)

Limits:

- Regions- 1- 100
- Cities- 1- 100
- Vehicles- 1- 20
- Multipliers- 0-10^6
- Initial Points- 0.0- 10^6
- Cost of Vehicle- 0 - 10^6
- Bounty of City- 0-10^6
- Vehicle Multipler- 0-1

File Input Format:

Number of regions
Number of cities
Color of region 1 X Multiplier of region 1
Color of region 2 X Multiplier of region 2
.
.

.
D: Distance Scaling Factor

<Initial Money>

Color of city 1 Booty of city 1 No. of vehicles Cost of vehicle 1 Distance Scaling Factor of vehicle 1
...
Color of city 2 Booty of city 2 No. of vehicles Cost of vehicle 1 Distance Scaling Factor of vehicle 1 .
.
.
.

Output Format:

<Final Bounty>

C:

C:

V:
.
.
.

END

- Coordinates format: C:
- Vehicle Info: V:
- Stop format: END

Download:

- Sample Input File
- Sample Output File

Download Sample Solution with Readme file

ROUND 2

Round Two involves similar maps with same objectives with following rules:

- The marauder will possess X points in the beginning.

- The map-data will be supplied in the same manner along with the input file.
- The Marauder can travel in any path now ie path need not be in straight lines and can be any path represented by pixel coordinates where consecutive coordinates are travelled in straight lines.
- Vehicles can only be hired when in cities and any attempt to buy a wrong vehicle in a city or buying a vehicle in cities will incur costs.
- The task is same as the First round i.e. maximize the final money possessed.
- All the maps are warpable which means going out of the left edge will bring you to the right side and going out of the map from the top edge will bring you to the bottom and vice versa for right and bottom edges. So the participant needs to mention in the output file along with the next coordinate if he is warping or not.

The following information will be given in legend:

- Number of regions
- Number of cities
- Initial Points (X)
- Travel Cost Factor for each region. Different regions have different terrain and hence the ease of travelling varies. The invader loses money proportional to this factor while traversing that particular region.
- Money earned on looting each city.
- No of vehicles in city
- Money lost by hiring a particular vehicle from a city for the journey to the next city.
- Distance Scaling Factor. Translates pixel distance to real distance.

Sample Output File:

<Final Bounty>

C: <xcoordinate> <ycoordinate> NW

C: <xcoordinate> <ycoordinate> WU

C: <xcoordinate> <ycoordinate> WD

V: <vehicle name> (Valid only if previous coordinate is a city)

.

.

.

END

- WU - Warp Up
- WD - Warp Down
- WL - Warp Left
- WR - Warp Right
- NW – No Warp

SCORING

Score of single Map = Total Money earned for cities visited - (Terrain Multiplier of the region)* (Bresenham distance travelled in pixel values/ D) - (Hiring of vehicles) - Cost of Penalties
D= Given D * Vehicle Multiplier (=1 in the beginning)

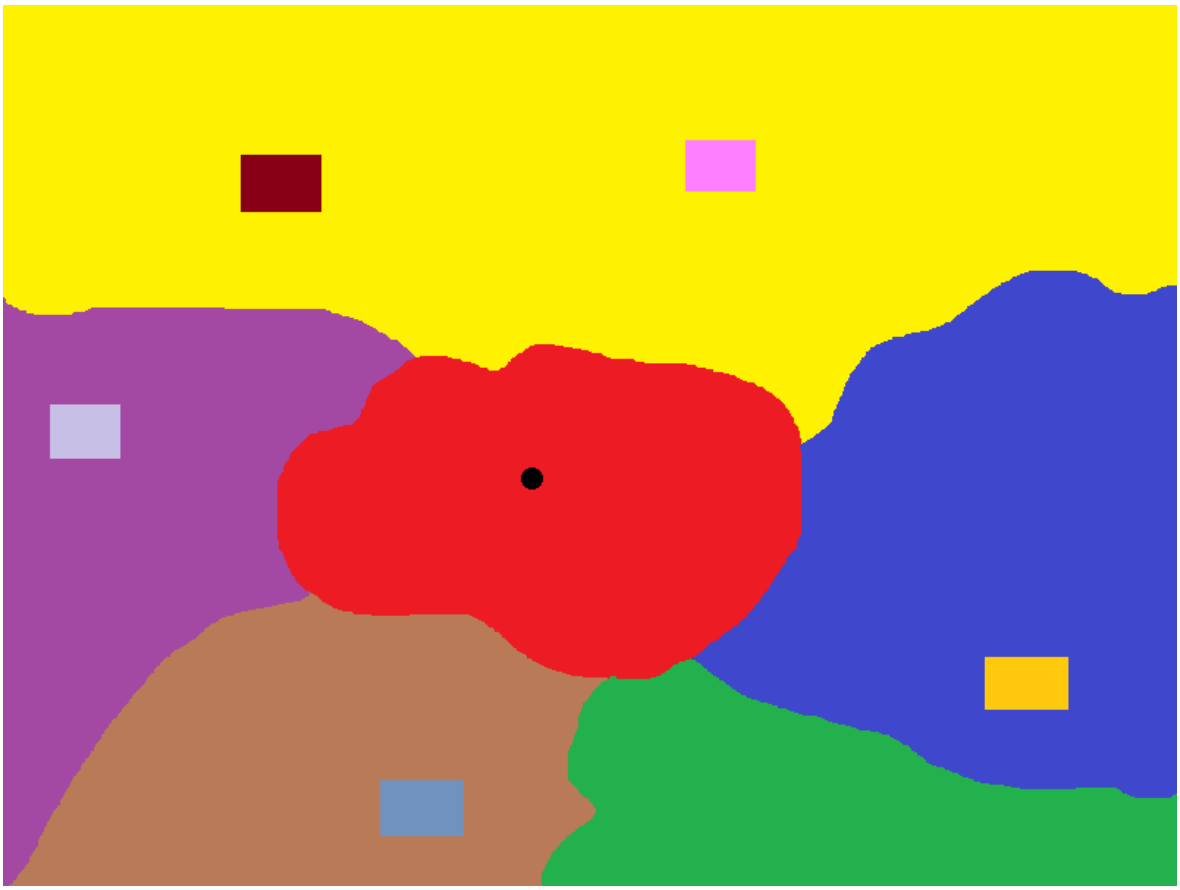
Penalties:

- Invalid Start Point: - 1000
- Invalid Coordinates - 1000
- Buying Vehicle in non-city coordiates - 1000
- Buying unavailable vehicle - 500
- Not sending END – 3000

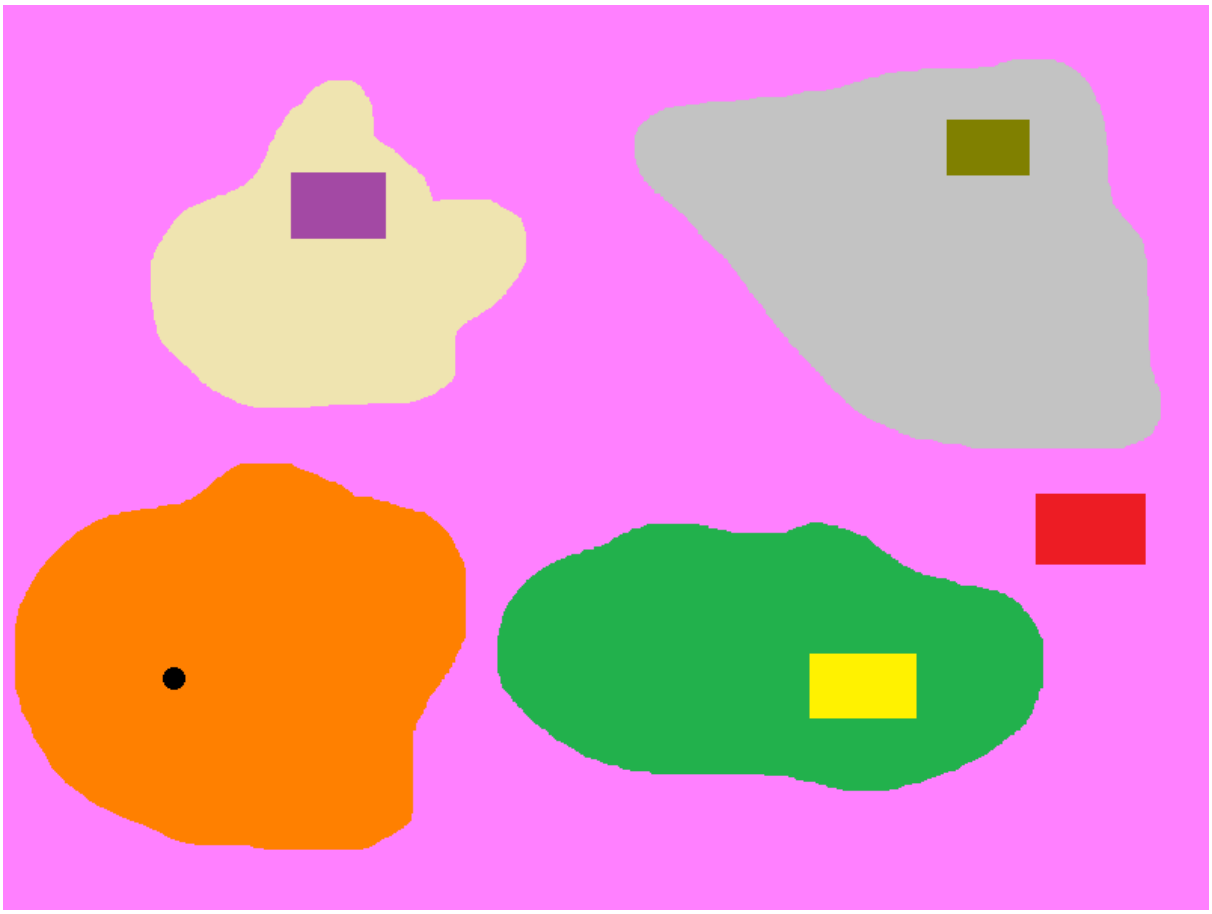
SAMPLE INPUT

Right Click - > Save to save each image. Download the corresponding text input file from each link

Input Map 1



Input Map 2

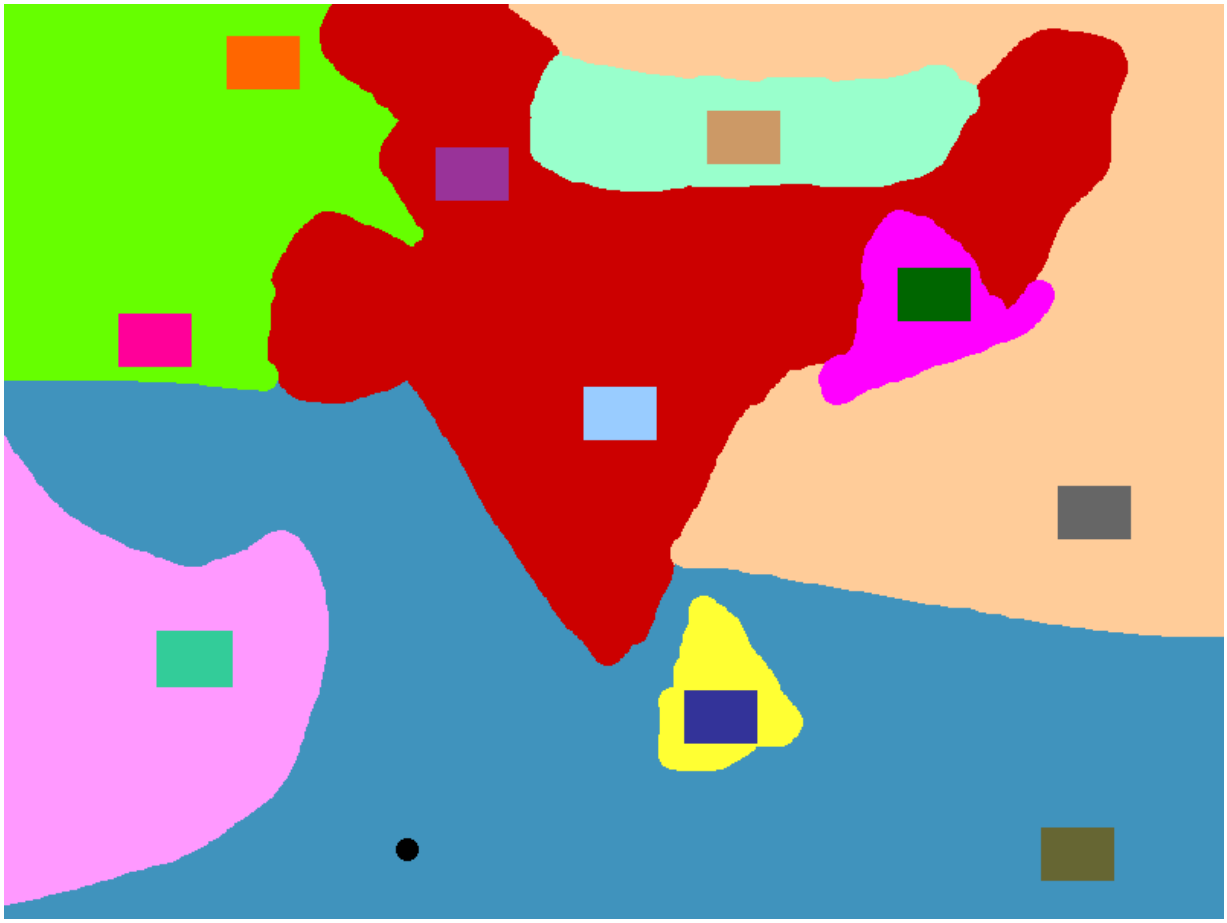


Input Map 3

Input Map 4

Input Map 5

Input Map 6



TUTORIALS

Link to the tutorial for this event: http://robotix.in/events/tutorial/the_marauders_map
Tutorials for general robotics are available at http://robotix.in/tutorials

FORUM

In case of doubts regarding this event, feel free to post on our forum and Facebook group:
Forum: http://forum.robotix.in/
Facebook Group: https://www.facebook.com/groups/382980611785617/

REGISTRATION

For registration, visit http://ktj.in/register/reg.php

EVENT HEADS

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