CSC 415/515 Introduction to Mobile Robotics
Project 1

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Due 10/24/2012

Your goal for this project is to use your knowledge of forward kinematics for a 2-wheeled differential drive robot to write software for tracking the pose of the robot in real time.

1 Input

Your program will read a file containing data that was collected by running a Nomadic SuperScout robot. The data file consists of 13566 integers arranged in a matrix of 7537 rows by 18 columns. For this project, you are only interested in the first two columns.

While the robot was wandering in its environment, sensors were read at a rate of 10 Hz. Each row in the data file represents one sensor reading from the robot. The first column of data is the linear velocity of the right wheel in $\frac{1}{10}$ of an inch per second. The second column is the velocity of the left wheel in $\frac{1}{10}$ of an inch per second. We would prefer to work in SI units, so you should convert the input data to centimeters per second before using it. You can ignore the remaining 16 columns of data.

2 Output

Your program is to output three columns of numbers showing the the pose of the robot at 0.1 second intervals (one output line for each input line). The x and y values should be output as *centimeters* relative to the starting position of $(0, 0)$ and should show two decimal places. In other words, the output should be rounded to the nearest millimeter. The heading, θ, should be output in radians and should be rounded to four decimal places.

3 Reusability

You are strongly advised to create a function that updates the position, so that it can be re-used later in the course. C/C++ and MatLab both support the creation of functions that can be reused. Your function should accept the the left and right wheel linear velocities, the distance between the wheels, and the time increment. Velocities should be given in centimeters per second, and the time increment should given in seconds. For this example, the time increment will always be 0.1, but that value should not be hard-coded into your function..

3.1 C/C++

The suggested function header for C/C++ is

```
triplet_t get_deltas(lvel, rvel, double L, double delta_t)
```

given that `triplet_t` is defined previously as:

```
typedef struct{
double x, y, theta;
}triplet_t;
```

3.2 Matlab

The suggested function header for Matlab is

```
function [dx, dy, dtheta] = get_deltas(lvel,rvel,L,delta_t)
```

4 Program Submission

Submit your program code, the .m or .cpp file(s) only, at `http://www.mcs.sdsmt.edu/submit` before midnight of the due date. (Your file gets time stamped, so late submissions will be noted and may be given a late penalty!) Be sure to submit to the correct lecture section!

DO YOUR OWN WORK.