

## MTRE 2610 – Engineering algorithms and visualization – Dr. Kevin McFall

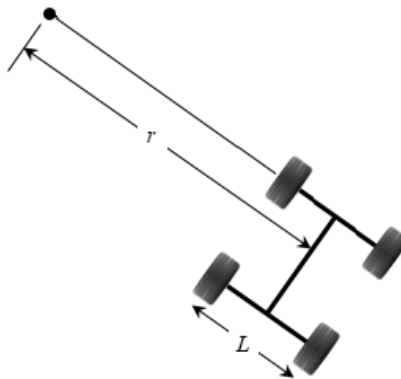
### Homework – Vectors

1. Write a loop to create a vector of integers containing all the Fibonacci numbers less than or equal to 1000. Begin the vector containing values of 0 and 1. The next value in the Fibonacci series is the sum of the previous two. So the vector should finally contain the values 0, 1, 1, 2, 3, 5, 8, etc. up to no greater than 1000. Finally, loop through the vector and display each value in the vector to the screen.

2. Steering in a differential drive robot is accomplished by left and right wheels spinning at different speeds. The robot turns left if the right wheel spins faster, and vice versa. Consider a robot with wheel encoders that supply the angular speeds  $\omega_1$  and  $\omega_2$  in rad/s for the left and right wheels, respectively. The turn radius  $r$  of robot motion is determined by

$$r = \frac{L(\omega_1 + \omega_2)}{2(\omega_2 - \omega_1)}$$

where  $L$  is the axle track.



Each row of the file HW01data.txt contains values for  $\omega_1$ , and  $\omega_2$  sampled from robot motion where  $L = 28$  cm. The code

```
# include <iostream>
# include <fstream>
using namespace std;
int main() {
    ifstream inData("HW01data.txt");
    float o1, o2;
    while (!inData.eof()) {
        inData >> o1 >> o2;
        cout << "omega1 = " << o1 << " rad/s, omega2 = "
              << o2 << " rad/s" << endl;
    }
    inData.close();
    return 0;
}
```

loads and displays time and angular speed data from the text file, assuming it is placed in the same directory as the source code. Modify the code instead to load the data into two vectors, one for each of the two variables. Create

another vector, the same size as the other two, containing the turning radius  $r$  for each combination of  $\omega_1$ , and  $\omega_2$ . Display each of the turning radii, with appropriate units.