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/*************************************************
 * HeeChan Kang
 * CSC 431 - AI Robotics
 * Assignment Two - Arm Localization
 *************************************************/

#include <stdio.h>
#include <stdlib.h>
#include <math.h>

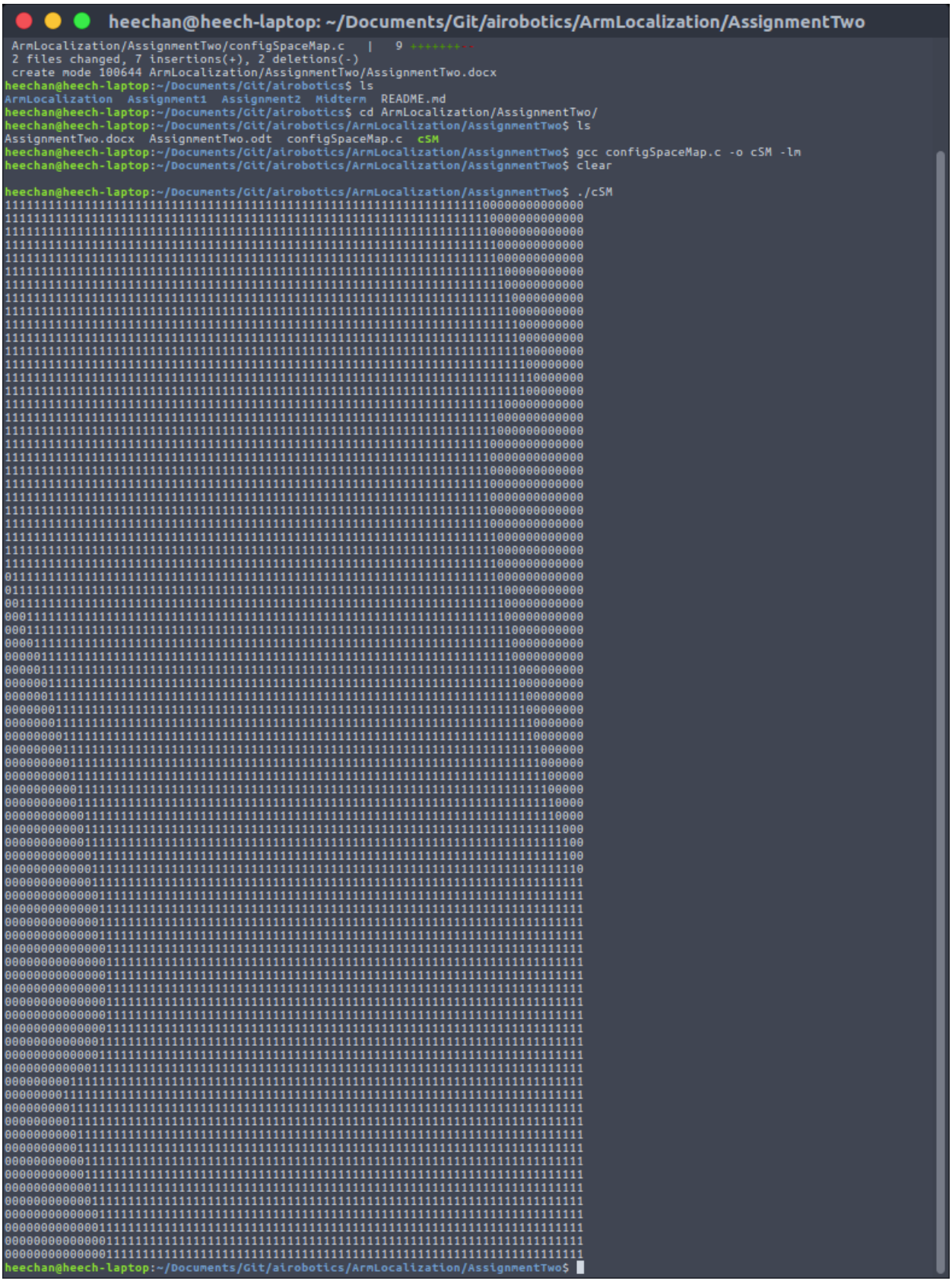
int checkAngle (double alpha, double beta);

void main() {
    double alpha, beta, x, y, x_temp;
    double base = 100.0, l1 = 80.0, l2 = 80.0, limit = 7*M_PI/8;
    int i, j;
    int row = 80, column = 80;

    for (i = 0; i < row; i++) {
        beta = limit - i*(2*limit)/row;
        for (j = 0; j < column; j++) {
            alpha = -limit + j*(2*limit)/column;
            printf("%d", checkAngle(alpha, beta));
        }
        printf("\n");
    }
}

/* Method that returns 0 if unreachable and 1 if reachable. */
int checkAngle (double alpha, double beta) {
    double base = 100.0, l1 = 80.0, l2 = 80.0;
    double x, y, x_temp;
    x = -l2*sin(alpha + beta) - l1*sin(alpha);
    y =  l2*cos(alpha + beta) + l1*cos(alpha) + base;

      /* Check if arm goes underground. */
      if (y < 0) { return 0; }
      /* Check if arm crosses its base. */
      if (y < base) {
            /* Compute location of "elbow". */
            x_temp = l1*cos(alpha + M_PI/2);
            /* Value is negative if "elbow" and "wrist" is on the opposite
            side. */
            if (x * x_temp < 0) { return 0; }
    }
    /* Otherwise, we are good to go. */
    return 1;
}
```


heechan@heech-laptop: ~/Documents/Git/airobotics/ArmLocalization/AssignmentTwo
ArmLocalization/AssignmentTwo/configSpaceMap.c | 9 +++++++--
2 files changed, 7 insertions(+), 2 deletions(-)
create mode 100644 ArmLocalization/AssignmentTwo/AssignmentTwo.docx
heechan@heech-laptop:~/Documents/Git/airobotics$ ls
ArmLocalization Assignment1 Assignment2 Midterm README.md
heechan@heech-laptop:~/Documents/Git/airobotics$ cd ArmLocalization/AssignmentTwo/
heechan@heech-laptop:~/Documents/Git/airobotics/ArmLocalization/AssignmentTwo$ ls
AssignmentTwo.docx AssignmentTwo.odt configSpaceMap.c cSM
heechan@heech-laptop:~/Documents/Git/airobotics/ArmLocalization/AssignmentTwo$ gcc configSpaceMap.c -o cSM -lm
heechan@heech-laptop:~/Documents/Git/airobotics/ArmLocalization/AssignmentTwo$ clear
heechan@heech-laptop:~/Documents/Git/airobotics/ArmLocalization/AssignmentTwo$ ./cSM
heechan@heech-laptop:~/Documents/Git/airobotics/ArmLocalization/AssignmentTwo$