User Manual for COMP9032 Helicopter Project

Author: Harold Jacob Hoare
StudentID: z5021639
Date: Semester 2, 2014

1. Lab Board Connections

AVR Port A pins 0 to 3 are connected to Keypad R0 to R3.
AVR Port A pins 4 to 7 are connected to Keypad C0 to C3.
AVR Port B pins 0 to 3 are connected to LCD control pins RW, DS, RS, BL.
AVR Port B pin 4 is connected to Mot.
AVR Port C pins 0 to 7 are connected to LCD D0 to D7.
AVR Port D pins 0 to 7 are connected to LED0 to LED7.
AVR Port E pin 7 is connected to pushbutton PB0.
AVR Port E pin 6 is connected to pushbutton PB1.

2. Flight Instructions

Take-off
Press reset on the lab board to begin the program and display the start message. Press the '#' key on the keypad to take-off.
Initially the helicopter travels upwards at 1 m/s. The position is updated on the LCD display every 0.5 seconds.

Speed change
If PB0 is pressed the flight speed increases by 1 m/s upto a maximum of 4m/s.
If PB1 is pressed the flight speed decreases by 1 m/s down to a minimum of 0m/s.
When the flight speed is adjusted the rotor speed (simulated by the motor) changes to one of 4 levels correspondingly. If the flight speed is reduced from 1m/s the rotor speed remains at the lowest level.

Hovering
If the speed is decreased from 1m/s or the '*' key is pressed the helicopter enters a hoveing state.
The initial hovering rotor speed is set by the flight speed immediately prior to hovering.

When in a hovering state (and only when hovering) the keypad can be used to enter a new direction as follows :

1 = Positive x direction, shown as L for left on the LCD display.
2 = Positive y direction, shown as F for forwards.
3 = Positive z direction, shown as U for up.
4 = Negative x direction, shown as R for right.
5 = Negative y direction, shown as B for backwards.
6 = Negative z direction, shown as D for down.

Also whilst hovering, if PB0 is pressed the rotor speed increases and if PB1 is pressed the rotor speed decreases.

When '*' is pressed again the helicopter resumes travel in the current direction at the speed

according to the rotors.

Landing
If the vertical z coordinate reaches zero and the speed downwards is 2m/s or less the helicopter successfully lands. The distance travelled and time of flight are displayed. The motor stops.
During flight or hovering pressing the '#' key makes the helicopter fly downwards at 1m/s, meaning that it will land if no other inputs are given.

Crash
If the helicoipter touches the walls or ceiling at any speed, or hits the floor with speed of 3m/s or more it crashes. The LCD display displays the position, the LED bars flash and the motor stops.

Reset
After crashing or landing the reset button on the lab board must be pressed to restart the simulation.