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| Student ID  For group assignments, list each student’s ID | U 6366102 | | |
| Course Code | ENGN 6423 | | |
| Course Name | Robotics | | |
| Assignment number |  | | |
| Assignment Topic |  | | |
| Lecturer | Dr. Viorella Ila / Dr. Rob Mahony | | |
| Tutor |  | | |
| Tutorial (day and time) |  | | |
| Word count |  | Due Date | 12/08/2018 |
| Date Submitted | 11/08/18 | Extension Granted |  |

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Questions:

1. The process of creating a package involves the following steps,
2. Initialise a directory using ‘mkdir’ command.
3. Create a ‘catkin’ workspace
4. Source the terminal for changes to take effect.
5. Create a package using ‘catkin\_create\_pkg’.

This creates a package of given name. To compile launch/ python files in the package, move to the location of the launch/python file and use roslaunch/ rosrun respectively to execute the file[1]. In case of error in rosrun command, use ‘chmod +x /path/filename.py’ which gives permissions to execute file[1].

$ cd ~/catkin\_ws/src

$ catkin\_create\_pkg <package\_name> rospy roscpp std\_msgs

1. The call-back functions are called in occurrence or non-occurrence of an event (for example, sensor detection). In the event of sensing of bump sensor, the topic ‘bumpSensor’ calls the call-back function which in turn tells the system what to do like to print “Bump sensor is sensed” or to stop the robot. In short, the call-back function describes the system what needs to be done and is called whenever a function is called[1].
2. Bumper and cliff sensors are to be monitored/ pinged continuously to ensure the safety of the bot. Bumper sensor senses obstacles (considerably large) in robot’s path and stops the bot when the sensor is pressed[2]. Cliff sensor warrants that the bot does not fall off a cliff which could potentially disrupt/ discontinue the operation of the robot.
3. Leg – based locomotion[3]:

Pros:

* Manoeuvrability
* More degrees of freedom
* Multi-purpose (picking/kicking/moving objects)

Cons:

* Complex control algorithm
* Maintenance of stability
* Difficult to build

Wheel – based locomotion[3]:

Pros:

* Highly stable
* Simpler control as the degrees of freedom is low
* Easy to build

Cons:

* Traction/friction which can affect the choice of motors and suitable for flat surfaces
* Manoeuvrability since the axis of the wheels are fixed
* Low degrees of freedom

1. Four basic types of wheels

* Standard wheel
* Castor wheel
* Swedish wheel
* Ball/ spherical wheel

Swedish wheel, castor wheel and ball/spherical wheel can generate omnidirectional motion[3].

References:

[1] *ROS Documentation*.

[2] D. R. Mahony, "Lecture Notes / slides," *ENGN 6623 Robotics,*

[3] Roland Siegwart, Illah R Nourbaksh, *Introduction to Autonomous Mobile Robots*. MIT Press, 2004.