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| Department of Software Engineering  Mehran University of Engineering and Technology, Jamshoro |

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| Course: Agent based Intelligent Systems (SW318) | | | |
| Instructor | ---- | **Assignment Type** | Complex Engineering Problem |
| Semester | 5th | **Year** | 3rd |
| Submission Deadline | ---- | **Assessment Score** | --- |

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| Complex Engineering Problem - Characteristics | | |
| 1 | Depth of knowledge Required | 🗹 |
| 2 | Range of Conflicting Requirements | 🞏 |
| 3 | Depth of Analysis Required | 🗹 |
| 4 | Infrequently Encountered Issues Involved | 🗹 |
| 5 | Beyond codes/standards of practice | 🞏 |
| 6 | Diverse groups of stakeholders with widely varying needs involved | 🞏 |
| 7 | Interdependence (high level problems including many component parts/sub-problems) | 🞏 |
| 8 | Have significant consequences in a range of contexts | 🗹 |
| 9 | Judgement (Require judgement in decision making) | 🗹 |

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| Problem Description |
| The Curiosity Mars rover developed, by NASA to travel on the surface of mars for the purpose of collecting soil samples from the red-planet’s surface to examine its contents so that any clue to either any past of life on the said planet or the possibility of starting a new one can be obtained, has a manual mode of travel, i.e., it needs to be remotely sent signals from the team at the NASA headquarters, so that it can navigate on the planet’s surface. The team examines the area around the rover by looking at the live data (pictures/video streams) sent by the rover, and chooses a path with no or little obstacles for the rover to follow.  The problem However, is that there is a long communication gap of almost 20 minutes, due to the extremely long distance of 239.5 million kilometers between the red-planet and earth, due to this long communication gap, the data sent by the rover and signals sent by the team reach at their destination 20 minutes too late, so the communication and data transfer cannot be termed as exactly live. This mode of communication poses a problem since the signals sent by the team reach the destination 20 minutes late, they can’t point to a precise path.  Another big problem occurs, is the fact that the rover only has 6 hours of battery time each sole (1 Martian day), so it has to make the most of it, and be sure not to waste any of it.  The solution, is proposed in the form of autonomous navigation, we need to think of a way to make the rover process the ground data, and choose the best path to navigate on the surface of Mars so as to avoid any obstacles and reach its destination.  For this purpose, the use of SPOC (Soil Property and Object Classification), a class of software capabilities that utilizes machine learning to classify terrain types from imagery has been employed. The software subsystem processes the data it gets from the camera (NAVCAM) of the rover and classifies the objects on the surface of Mars to help it choose the best path and navigate safely. | |

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| Rubrics | Assessment | | | | | Marks |
| Unacceptable | Poor | Acceptable | Adequate | Proficient |
| R1 Identification of constraints/requirements/demands | 🞏 | 🞏 | 🞏 | 🞏 | 🞏 |  |
| R2 Originality/contribution | 🞏 | 🞏 | 🞏 | 🞏 | 🞏 |  |
| R3 Engineering knowledge (standards) | 🞏 | 🞏 | 🞏 | 🞏 | 🞏 |  |
| R4 Efficiency of the solution | 🞏 | 🞏 | 🞏 | 🞏 | 🞏 |  |
| Total Marks | | | | | | 10 |