**PART A-3**

**Final Year Plan for Tasking Algorithms**

Brief Description of Algorithm

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| --- | --- | --- |
| **S/N** | **Brief Description** | **Application in Benchmark Problems** |
| Algo 1 | Algorithm are allocate the best-suited UAVs to provide the requested service in optimal way, all without the intervention of a ground component. In current UAV operations, the service UAVs are centrally managed by Air-net UAVs and ground user requiring UAV services would have to make a request to the centralized agency controlling the UAVs. This removes the need for a ground component to be continuously managing the UAV operations. | Benchmark Problem 2 |
| Algo 2 | Algorithm allows the UAVs manage themselves automatically as a team in a hierarchical and / or distributed manner. The centralized agency is no longer involved in receiving requests and allocating UAVs to the requests. It only needs to ensure that there are sufficient UAVs in the pool to service the requests. | Benchmark problem 2,  Benchmark problem 3. |

Algorithm Development Plan

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| --- | --- | --- | --- | --- |
| **S/N** | **Tasks / Gaps to address** | **D6** | **D7** | **D8** |
| Algo 1 | Algorithm development and implementation | X | X |  |
| Algo 2 | Algorithm development and implementation |  | X | X |

Benefits Compared with Classical approach and methods

Algo 1 benefits:

* Compared to classic methods on assignment problems, the proposed adaptive algorithm equipped with new optimality and sub-optimality conditions and guarantee the optimal solution, in opposite to heuristic methods.
* Faster then existing optimization methods.
* Adaptive. The UAVs can redeploy when the inputs are changed.

Algo 2 benefits:

* Algorithm allows the users to bypass the centralized agency to request for services. In this concept, the UAVs manage themselves automatically as a team in a hierarchical and / or distributed manner. Provide automatic self-allocation and self-deployment.

Validation Plan

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| --- | --- | --- | --- | --- |
| **S/N** | **Specific validation goal / validation means** | **D6** | **D7** | **D8** |
| Algo 1 | To show that the optimal solution can be computed for maximizing total service time . To validate using Matlab and Anylogic simulation software. | X | X |  |
| To test the algorithm for Tethered UAVs Self-Assignment Problem where it is possible to identify the “leader” among UAVs |  | X | X |
| Algo 2 | To show the functionality of the algorithm when integrated for the Benchmark Problem 3 (Search and Track) demonstration in the Unreal Simulator |  | X | X |
|  | To test the algorithm for Tethered UAVs Self-Assignment Problem where it is not possible to identify the “leader” among UAVs |  | X | X |

Transition Plan

* To package the algorithms:
  + with documentation on the algorithm design, properties and comparison with existing and classical methods
  + with a script file to demonstrate the use of algorithms in the Matlab toolbox
  + a demo imitation model on assignment problem with C++ and Java source codes
* Potential (TBC) receptacles of the algorithms are:
  + GS Div, DSO
  + ORL, DSO
  + MU, DSO
  + Mr Lam Chian Poh, STAe

Future Work

The following problems remain open at the end of the project and can be considered for future work:

To propose algorithms, based on developed Algo 1 and Algo 2 for synthesis of decentralized automatic control systems using decentralized real-time optimal control of a group of objects; in this case, the control function among individual systems of which each will be solved an individual autonomous problem (performs self-control) taking into account the actions of the other members of the group. In other words, in this case, the control functions will be distributed among other controllers that compute the current values of the feedback components for their own object in the group. Our approach can be based on a fast implementation of the dual method and the learning algorithm from information obtained by each controller from the other controllers working at the previous time moment.