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UAV CONFLICT DETECTION DURING THE MISSION

The usage of Unmanned Air Vehicles (UAVs) has been increasing rapidly.

The task of UAV missions is based on the input of initial position and coordinates of the destination. Coordinates of the initial position can be determined, by the use of satellite navigation system or indoor navigation systems (Inertial Navigation System, whether they can be set by user in the local coordinate system). The coordinates of the destination point are set according to the mission task.

Obtaining this data it is possible to determine the UAV trajectory that will be described with the help of line equation:

But the aviation safety requires the detection of obstacles at the planned flight trajectory.

If there is a crossing of planned flight trajectory with any point of an obstacle it is necessary to overfly the obstacle with minimum deviation from the planned trajectory regarding the aerodynamic possibilities of the UAV.

For a new trajectory creation one should find the maximum coordinates of the obstacle tops from the both sides of the crossing. To perform this operation it is necessary to find the distances matrix from the tops to the line of the trajectory.

In such a way the tops are separated by the sides according to the line.

For a new trajectory creation it is necessary to choose the obstacle overfly direction. The choice will be prior to the side where the deviation will be minimal.

Thus, one should find the maximum deviation from the both sides of line and choose their minimum:

Using dmin, the coordinates of the intermediate overfly point are defined.

The next step will be the heading change of the planned trajectory including the top at the next step of iteration.

But the obstacle has complicated form and the changed trajectory can also cross the shape of the obstacle.

Hence, the previous procedure should be done once more regarding the new trajectory with current position and the obstacle overfly point.

If any positive point is found, the destination will be changed prior to it.

As a result the first obstacle overfly point will be determined that will provide the heading change according to this point.

The modeling can be applied to the aeronautical charts that are characterized by prohibited (P), dangerous (D) and restricted (R) areas.

UAVs can be used not only in civil aviation, but also provide other effective applications. Therefore UAV flight should be safety (omitting all the prohibited, dangerous and restricted areas), fast and with minimum consumption of the resources.

Hence, nowadays the trajectory choice of minimal deviation from the complicated form objects is an important challenge.

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