

## Orbit Determination Modeling with Graphical Demonstration

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**Abstract :** In this paper, there is an implementation, verification, and graphical demonstration of a software application, which can be used swiftly over different preliminary orbit determination methods. A passive orbit determination method is used in this study to determine the location of a satellite or a flying body. It is named a passive orbit determination because it depends on observation without the use of any aids (radio and laser) installed on satellite. In order to understand how these methods work and how their output is accurate when compared with available verification data, the built models help in knowing the different inputs used with each method. Output from the different orbit determination methods (Gibbs, Lambert, and Gauss) will be compared with each other and verified by the data obtained from Satellite Tool Kit (STK) application. A modified model including all of the orbit determination methods using the same input will be introduced to investigate different models output (orbital parameters) for the same input (azimuth, elevation, and time). Simulation software is implemented using MATLAB. A Graphical User Interface (GUI) application named OrDet is produced using the GUI of MATLAB. It includes all the available used inputs and it outputs the current Classical Orbital Elements (COE) of satellite under observation. Produced COE are then used to propagate for a complete revolution and plotted on a 3-D view. Modified model which uses an adapter to allow same input parameters, passes these parameters to the preliminary orbit determination methods under study. Result from all orbit determination methods yield exactly the same COE output, which shows the equality of concept in determination of satellite's location, but with different numerical methods.

**Keywords :** orbit determination, STK, Matlab-GUI, satellite tracking

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