University of Baghdad	
Department	Surveying Engineering
Full Name	Zahraa Azeldeen Husain
Thesis Title	MODELING AND CONFIGURATION OF BASELINE FOR GLOBAL NAVIGATION SATELLITE SYSTEMS GEODETIC NETWORK
Year	2014
Abstract	The quality of Global Navigation Satellite Systems (GNSS) networks are considerably influenced by the configuration of the observed baselines. Where, the selection of optimal GNSS baselines affects significantly on improving GNSS networks quality and cost of the fieldworks. Precision and reliability are of the main effective elements to assess the quality of GNSS networks. Generally, precision is the measure of the geodetic network efficiency for propagation of the random errors, while reliability reflects the ability of the geodetic network to detect outliers. This study aims to find an optimal configuration for GNSS baselines in terms of the number and distribution baselines to improving quality criteria of GNSS networks. First order design problem (FOD) was applied in this research to optimize GNSS network baselines configuration. Three essential components were considered to build up FOD problem in this research. The first component involved selecting both of A-and E-optimality as objective functions of precision, which lead to a homogenous and an isotropic network, respectively. The redundancy number was additionally taken within the first component as an objective function of reliability. Regarding the second component, GNSS baseline configuration was considered as a variable that affects on the values of objective functions. In third component, sequential adjustment method based on analytical search technique was employed to optimize GNSS baselines configuration that improving objective functions. Four proposed models were developed and adopted for optimizing GNSS baselines configuration, these are: FOD for optimum precision(FOD-p), FOD for optimum reliability(FOD-r), FOD for optimum precision and reliability (FOD-pr), and FOD for optimum precision, and reliability with fixing control stations (FOD-prc). In this study, Matlab programming language (V. 2012a) with Graphic User Interface (GUI) was used to computerize these four developed model. Where, two GNSS networks were taken as case study areas, the University of Baghdad, Aljadrya campus, network which consists of ten stations, and Al Ghammas Township, Al-Qadisiya city, which consists of twenty-five stations. In general, the three objective functions for both of precision and reliability were witnessed a significant improvement by the four mathematical models. However, the level of improvement of the objective functions with both of FOD-p, FOD-r, and FOD-pr models is better than when they applied with FOD-prc. This leads to a conclusion that the baseline configuration based on FOD with free adjustment is more effectively than FOD with fixing control stations. Furthermore, the general finding to emerge from this study is that the rank of objective function enhancement is more noticeable in the second study area compared to the first study area. Additionally, the increasing number of GNSS network

	stations, as in the second study area, leads to increase t probabilities for baseline configuration. Where in the firs area there are 45 potential baselines, which were reduce the optimum configuration to about 30% of the total pro For the second study area, there are 300 potential baselines, which were reduced during the optimum configuration to about 70% of the total potential baselines. This finding leads to a conclusion that FOD problem, in general, is more efficient with the large GNSS network. Finally, these outcomes were verified by field survey using three GR5 TOPCON receivers in each session.