

Title: Digital Aerial Imagery of Unmanned Aerial Vehicle for Various Applications

Author/Authors: Anuar Ahmad, Khairul Nizam Tahar, Wani Sofia Udin, Khairil Afendy Hashim, NorHadija Darwin, Mohd Hafis Mohd Room, Nurul Farhah Adul Hamid, Noor Aniqah Mohd Azhar, Shahrul Mardhiah Azmi

Abstract: Digital aerial imagery (DAI) can be acquired using digital mapping camera attached to light aircraft. The DAI is used for the production of topographic and thematic map. The cost of acquiring DAI is very expensive and suitable for large area coverage. The acquisition of DAI is not economical and suitable for small area coverage. Therefore an alternative method should be used to fulfill this need. There are two alternative methods that can be used for acquisition of DAI which include using a small format digital camera attached to light aircraft and using a small format attached to an unmanned aerial vehicle (UAV). UAV system has been reported used in various and diversified applications such as mapping applications (eg. map revision, landslide, coastal erosion, archaeology, forestry), industrial application (eg. engineering, crash accident), Geographic Information System (GIS) applications and others. In this study, micro unmanned aerial vehicle (UAV) systems which comprise of fixed wing UAV flying and rotary UAV are attached with small format high resolution digital camera to acquire DAI for the purpose of mapping at the flying height of 300m at 100m respectively. The micro UAVs were flown autonomously (i.e automatically) and a series of DAIs of a slope using fixed wing UAV and a stream using rotary UAV were acquired rapidly within short period. Ground control point (GCP) and check point (CP) were established using the Global Positioning System and conventional Total Station techniques around the study area for the slope and stream respectively for the purpose of digital image processing and accuracy assessment. The DAIs were processed to produce photogrammetric output such as digital elevation model (DEM) and orthophoto. All these photogrammetric products were successfully produced and assessed. The achievable accuracy is less than $\pm 1\text{m}$ for slope mapping and $\pm 0.280\text{m}$ for stream mapping. In this study, it is proven that the micro UAV system can be used for mapping which cover small area. As conclusion, micro UAV is suitable for mapping small area, rapid data acquisition, accurate, low cost and can be employed for various applications.