

EGU2020-6255

<https://doi.org/10.5194/egusphere-egu2020-6255>

EGU General Assembly 2020

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## Orthomosaics of Historical Aerial Photographs and Horizontal Accuracy Analysis

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Orthomosaics from aerial photographs play a pivotal role in understanding land-use/land cover in broad area and the advent of image processing technology allows us to produce orthoimagery. However, recent advanced technologies are seldom applied to produce historical orthophotos from early or mid 20C old aerial photos in broad extent since they have limited information (e.g. camera position, flying altitude, and yaw) which is critical information for orthomosaics. In this context, this study aims to orthomosaic and georectify historical aerial photographs and validate the horizontal accuracy of orthomosaicked outputs. In order to achieve this, firstly, we collected 117 aerial photographs of 1934 (scale 1:12,000) and 68 of 1951 (scale 1:20,000) from UConn air photo archive focused on Woodstock town in Connecticut, USA. Secondly, we created GCPs (Ground Control Points) as referenced points where they have not changed over time by overlaying multiple datasets such as LiDAR DEM, hillshade map, recent orthoimagery. Thirdly, we align photos with Control Points (CPs), build a mesh, and build orthomosaics of 1934 and 1951, respectively, using Agisoft Photoscan 1.5. Lastly, calculating RMSE (Root Mean Square Error) and offsets comparing between set of GCPs and CPs from Lidar DEM and set of them digitized from orthomosaics. As a result, RMSE values of GCPs and CPs between 1934 and 1951 mostly show that output of this work is acceptable to use for standard mapping and GIS work or visualization based on ASPRS 1990 horizontal accuracy standard. In addition, we found several factors affect horizontal accuracy of orthomosaics; resolution of aerial photos, spatial distribution of GCPs and CPs, the number of CPs and GCPs, the percentage of lateral overlapping area along flight strips, and margin area. Overall, applying automated orthomosaicking image processing to historical aerial photographs has the potential to represent historical landscape and even detect its change in broad extent.