Creating interactive colorized 3D models from historical aerial imagery
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Historical stereo aerial photographs provide a detail rich means of viewing and understanding historic landscapes. Unfortunately, viewing these images in stereo often requires specialized equipment, and most historical images are panchromatic, making them less engaging and more difficult for members of the general public to interpret. This paper describes and demonstrates a method of creating interactive colorized 3D models of historical landscapes using historical aerial images. Image colorization is performed using an automated technique described in this paper that fuses the luminance data from the historical imagery with color information (chromaticity) from modern imagery of the same area. Different methods are used for estimating the chromaticity depending on whether the land cover in the area has changed, which is determined using a texture-based change detection approach. If the area has not changed, the color information is obtained from the same location in the color image as the pixel being processed in the historical image. If the area has changed, the color data is obtained from areas of the color image having similar textural properties using a lookup table. A digital surface model (DSM) is then generated from the stereo imagery using a commercial remote sensing software package (PCI Geomatica). The DSM and colorized image are combined together to create interactive models that can be readily viewed and manipulated in a web browser using the Qgis2threejs plugin for QGIS. Models have been generated in this way to allow interactive viewing of historical imagery from multiple areas, including Minneapolis, Washington DC, Boston, and the Outer Banks of North Carolina.