First test of low cost Raspberry Pi 3 computer as a tool for forest inventory

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Close-range photogrammetry (CRP) represents very perspective technology for many fields. It can provide results comparable to terrestrial laser scanning, and the hardware is still much cheaper. Our research group is developing low-cost CRP device based on Raspberry Pi 3 computer. It is a small computer (credit card size) with relatively high computing power and low price (around 35 euros for a computer). In connection with a touchscreen, Picamera v2.1 (Sony IMX219 – 8-megapixel camera) and powerbank it becomes a portable device for imagery. Continues shooting based (1 image per second) image collection was carried out using regular RGB camera and NoIR (no infrared) camera at University Park. Images of the same area were collected by DSLR camera Canon EOS 70D (20.2 megapixels) as a controversy to our low-cost solution. The images were processed into a form of dense point cloud by Pix4D software package, and the diameters were estimated in ForestScan (forestscan.eu) using circle fitting method. All three point clouds are available at mapy.tuzvo.sk/egu2017. Diameters at three different heights (0.65m, 1.3m and 2m) were estimated for a sample of 4 trees. The root mean square error (RMSE) and relative RMSE of diameter estimation for regular RGB and NoIR cameras were 2.13cm and 6.9% and 2.54cm and 8.3% respectively. The RMSE and relative RMSE for diameters derived from point cloud created using Canon images were 1.18cm and 3.8% respectively. Results of our first test showed that Raspberry Pi camera solution has a potential for the use in forest inventory. Next steps of our research will focus on verifying presented results on larger plots and continue the developing multi-camera system based on Raspberry Pi computers.