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NAPPN Annual Conference Abstract: For5G: Using an Aerial Based Camera to Create Digital Twins in Cherry Orchards

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Digital twins are a promising approach to create a detailed data foundation providing new insights for breeders and farmers. Using digital twins can make harvest predictions more precise or help detect anomalies (like e.g. diseases or effects of stress) early on. Trees and orchards in particular could benefit from accurate plant data, including plant morphology, objective data like crop size/count per tree, etc.

Using a drone-mounted aerial camera we automatically navigate a cherry orchard and generate a series of 2D images as the basis for further processing. Since the processing and amount of data that can be stored on-board a drone is very limited, an approach was chosen to stream the data to the processing computer utilizing a 5G campus network.

3D color point clouds are generated from the 2D images and using AI-based segmentation and image processing each tree is separated into organs, and the tree's morphology is deconstructed. The different plant organs (trunk/branch, leaf, cherry) are then individually digitally modelled, directly generating interpretable values like volume or surface area for each individual plant organ.