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Reality to Virtuality to Reality

Building a Baubotanik Pavilion

Qiguan Shu

Students worked in shifts at the workshop. In the welding phase, the team must wear welding masks to protect the eyes from flashing light.

At the beginning of the winter semester 2020/21, the campus was not fully open. Only seminars and workshops in small groups were allowed to meet at Campus following hygiene rules and most students had been studying at home in front of screens for more than half a year. Bachelor students in their fifth semester which could not go abroad, where thus allowed to participare in master-level projects instead. In this context, teaching team at the Professorship of Green Technologies in Landscape Architecture decided to organize a design-and-build studio, welcoming both senior bachelor and master students studying either architecture or landscape architecture.

As no excursion was permitted with all students to visit the site and analyze it in the beginning of the workshop, a photogrammetry survey was conducted by the teaching team. Approximately 1500 photos from multiple perspectives were processed into a point cloud model of the site. In this way, students made a virtual visit to the location by wandering through the digital point cloud. Tutoring was also held in a hybrid mode: projectors, multi-directional microphones, and portable webcams enabled discussions parallel online and offline; sketches and working models were displayed in detail; real-time annotation could be added from multiple ends, so that opinion exchanges went fluent among students and tutors.

The students task was to design and build a Baubotanik Pavilion for the *Neue Kunst am Ried* in Wald-Ruhestetten. The participants merged three concepts into one final design. The design concluded in a complex roof geometry, which sits on top of 32 London Plane trees. The geometry of the roof is formed close to the natural shapes and positions of selected branches. The middle top of the roof was left open, so that the trees can grow out of it in the future.

After the design phase, the students worked hand-on to accomplish the pavilion roof supported by 32 London Plane trees.

The Prefabrication took place at Design Factory 1:1 at TUM department of architecture. Firstly, a tailored wooden scaffolding was built to support precise building of the roof truss. For each beam, the curvature and length of its components were obtained from the digital model. Secondly, complete beams were installed on the wooden scaffolding, forming the general roof frame. Next, the three-dimensional trusses were directly bent and welded on the fixed beams. Then, the whole pavilion roof was divided into forteen

pieces for lacquering and transporting. Finally, the 14 pieces were assembled into three larger components on the ground next to the site and lifted to the treetops.
The geometry, position, and rotation of the pavilion in the digital plan matched well with the reality on site. In the summer of 2021, all the 32 London Plane trees grew prosperously.
For the installation of the roof the students were allowed to take part in an excursion. The successful installation was celebrated with a barbeque on site.
The installation of shingles is scheduled in the next year. As trees grow, the conversations between natural elements and man-made structures will continue.

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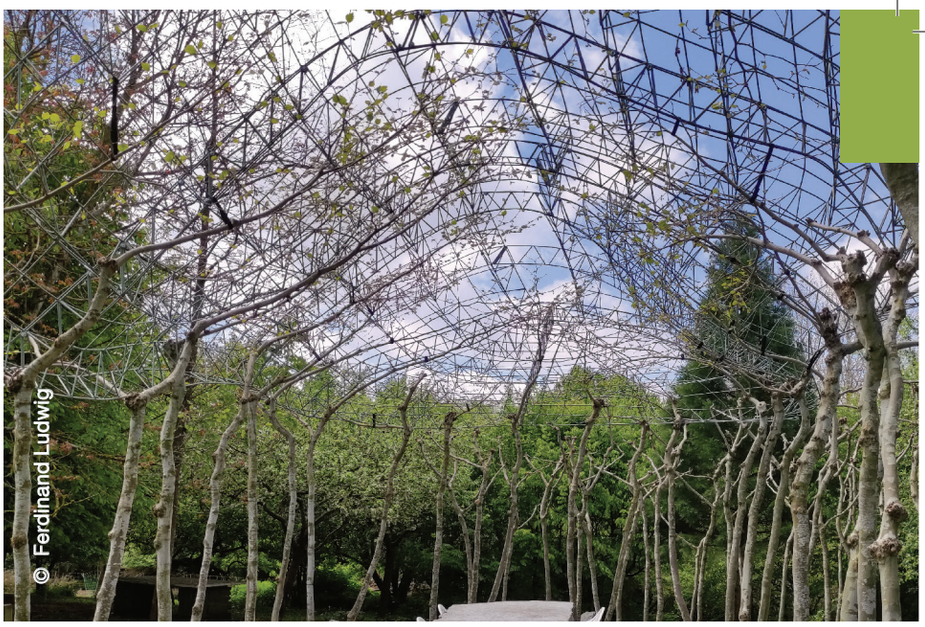
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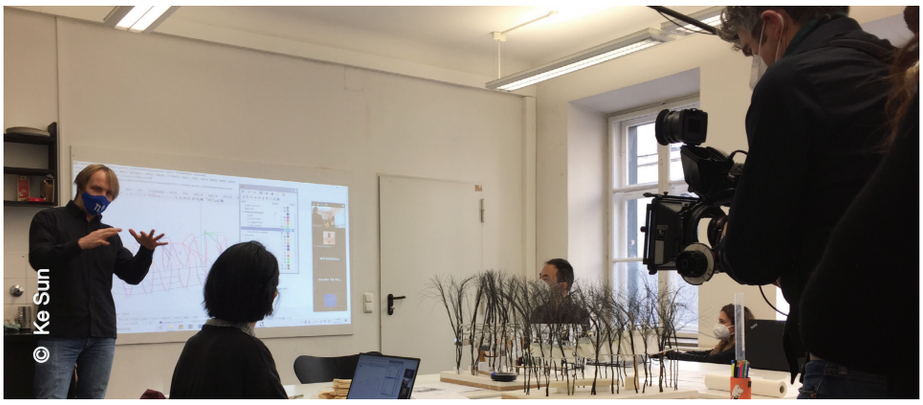
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top: After the installation, new leaves grow out. The project has a dynamic appearance through seasons with different shades, light and color
middle: The hybrid mode of tutoring in the studio was being documented by ZDF. Participants all wore a mask while keeping a social distance. Meanwhile, some students were joining the discussion online via Zoom.
bottom: final fixation of the structure component on the treetop. The twigs' pattern was in harmony with rhythmical rebar grids.