AT GRAMAZIO & KOHLER we engage with digital technologies both on a practical — and on a conceptual level. A critical view acknowledging the potentials as well as the limits of digital technology allows its selective and accurate use. As authors and researchers we thereby trust in our own senses and an integral understanding for architectural coherence. We are convinced that no algorithm, no optimization, no simulation, no system and no machine alone can lead to architectural quality. Technological performance will always be complemented and preceded by human desire, intelligence and sensibility.

Recognizing this cultural dimension and the diversified nature of architecture, we distrust a merely positivist, potentially unifying application of technology in design. Instead we strive to create meaningful moments where a tangible presence establishes itself from the synthesis between digital technology and built architecture. As we are not interested in producing vague speculations, we design strategically at a 1:1 scale, acknowledging the fact that the performance of materials and therefore many constructive principles are bound to their scale. The same applies to digital technology. We do not understand the digital as a metaphor for an

Architonic Concept Space, 2008

The Eroded Cubes are manifold sculptures that can be used as seating, table or wall objects combining additive and subtractive aesthetics. Their ambivalent expression fluctuates between that of an accumulative sculptural form and that of an eroded, seemingly amorphous mass. These objects are created from volumetric pixels, or “voxels,” that are bound within modular cubes of three sizes (0.5m, 1m, and 2m). Necessary parameters, such as interlocking segments and functional cavities, were considered throughout the shape selection and generation. An industrial robot assembled and glued these spatial structures, which were coated with an industrial strength rubber finish, from blocks of varying lengths, lastly producing objects whose mass is smaller the larger they are.
The Sequential Wall, ETH Zürich, 2008

This project investigates the architectonic and constructive potential of additive digital fabrication in timber construction. We designed a process in which a robot first cut commercially available wooden slats to length and then stacked them in a free arrangement. Such free arrangements allow high-resolution and subtle movements and transitions to be designed, running counter to the modular expression of the stacking. Straight lines flow seamlessly into curved ones, and on the wall's surface an interplay is produced between the rhythmic repetition of the directional wooden slats and the fine gradation of their lengths.

In the follow-up course the students were challenged to integrate the functional requirements to an external timber wall – for example its loadbearing and insulating behavior as well as its constructive waterproofing – into their design systems as generative parameters. Functional and formal characteristics were so tightly intertwined that they became mutually dependent.

architectural world of unlimited possibilities resolved by complex simulations. Rather, we are interested in its operational and conceptual characteristics offering unforeseen ventures in conceiving architectural designs.

We are convinced that architecture has so far only marginally benefited from the so-called digital revolution. Our work addresses the uncovering of this unused potential by connecting the digital explicitly to the material nature of built architecture. We investigate the conceptual affinity between construction and computation. This connection is achieved by directly linking two crafts, the craft of constructive design and the craft of computer programming. By mapping the savoir-faire of construction into a programmed logic we gain direct control over the making of buildings. This synthesis, enabled by the techniques of digital fabrication, allows the architect to directly control the buildup of material through design data. For the first time in history, architects explicitly control the building process.
Orthodox Synagogue, Potsdam, 2009

As the heart of the community center, the synagogue will not be hidden in the block courtyard. Instead, it sits directly on the street integrated with the all the functions that a Jewish center represents.

The interior atmosphere is made possible by the gradual opening of the travertine façade which stands behind a glass wall on the top two floors. Both the synagogue benches and ceiling are of wood and make reference to the historic synagogues of Eastern Europe. The floor and front wall remain neutral. The daily and seasonal change of light will animate the serene space.

The path from the street-level entry hall to the synagogue as the conclusion of the building determines not only the spatial organization but the façade as well. As a reinforced concrete structure, the long sides of the building are dressed in a façade of travertine stones, which are punctuated by windows on the first and second floors. The south-side street-level façade is closed, except for the glazed and setback entry foyer that visually links the street to the garden. In favor of filigree, the façade loses its massiveness as it rises. This transformation, which begins after the increasingly spacious middle rooms, is achieved with a linear stacking structure at sixty degrees whose rotation creates a Star of David motif. The façade gradient transforms the wall into a textile, the profane into the celebratory. This process culminates at the synagogue, allowing light to pass through the side walls. Both monumental and ephemeral, the idea of the Temple and the Tabernacle are united in the atmosphere of the synagogue. In another material and scale, the fading wall motif continues on to the ceiling in the form of a wooden screen.
Gantenbein Vineyard Façade, Fläsch (Switzerland), 2006, non-standardized brick façade

The project was realized as an extension of a small but remarkably successful vineyard. Bearth & Deplazes Architects designed the project, which was already under construction when they invited Gramazio & Kohler to design its façade.

The initial design proposed a simple concrete skeleton filled with bricks: The masonry acts as a temperature buffer, as well as filtering the sunlight for the fermentation room behind it. The bricks are offset so that daylight penetrates the hall through the gaps between the bricks. Direct sunlight, which would have a detrimental effect on the fermentation, is however excluded. Polycarbonate panels are mounted inside to protect against wind. On the upper floor, the bricks form the balustrade of the roof terrace.

The robotic production method developed at the ETH enabled laying each one of the 20,000 bricks precisely according to programmed parameters – at the desired angle and at the exact prescribed intervals.

To create the façade, a generation process was designed. The concrete frame construction by Bearth & Deplazes was interpreted as a basket and filled with abstract, oversized grapes of varying diameters, digitally simulating a gravity affect. The digital image data was then transferred to the rotation of the individual bricks.