

New technologies in architecture

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Modern architecture breaks away from cookie-cutter design and traditional aesthetics. It strives to create home designs that go beyond “standard” ideas and instead pursue projects inspired by layout, location, and function. Frank Lloyd Wright’s mentor, Louis Sullivan famously stated that “Form follows function”. This idea is expressed by Modernisms’ tendency to have land or the function of a project dictate much of the design ideas. For example, Wright was famous for building with the land – his residential homes almost always relied on the lot to determine how the building was to be laid out. Wright believed that a building should be “one with the land” and not simply plopped down on top of it. Modernist architecture takes inspiration from the project itself – if the project is meant to showcase something, house something particular or be occupied by a particular person. Modern architecture’s aim is to design for each unique situation and to be inspired by its purpose. To move towards future design process *Innovation and Incubation (FII)* group in London has created new program *Computational design + optimization (CDO)*.

CDO is about formalizing aspects of design tasks as computational models so that iterative computation, both interactive and automated, can be used to find feasible and performance-driven design alternatives that would be difficult to arrive at using conventional computing and design processes alone. CDO builds on and incorporates other emerging design computing technologies, including algorithmic design, 3-D parametric and associative geometry, performance-based design, integrated design tools, and design automation.

The CDO field is vast, and comprises research in mathematics, operations research, architecture, aerospace, mechanical engineering, and civil engineering. As a starting example, CDO has been used to generate optimized design alternatives for a scenario involving a media centre in Paris that includes a gallery space, meeting room, reception area, and director’s office, all with different lighting requirements. The facade comprises 496 panels (design variables) chosen from four types (opaque, clear, diffused, shaded) that combine to produce 4.2×10^{298} possible designs. Extending expertise in CDO involves successfully combining modelling, methods, tools and people. Recent progress in applying CDO in practice has extended the state-of-the-art of use in many countries. Benefits starting to be realized include extending what designers can currently do, enhancing design understanding, and improving design quality, time, and cost. Design time savings are often realized through the design automation component of CDO.