Bloom

Distributed Urban Game

by Alisa Andrasek and José Sanchez
# Project Details

**Designers:** Alisa Andrasek and José Sanchez  
Andrasek and Sanchez are partners and principal designers of Bloom Games. Andrasek was responsible for the conceptual development, design development and fabrication. Sanchez was responsible for the conceptual design development, design development and scripting/software design.

**Title:** Bloom: Distributed Urban Game

**Output type:** Design

**Function:** Interactive urban game and series of follies

**Locations:** Victoria Park, London; Cutty Sark, Greenwich; Affordable Art Fair, London; Battersea and Hampstead Heath; FRAC (Le Fonds Régional d’Art Contemporain), Orleans; Global Design NYU at The Building Centre, London.

**Client:** Mayor of London, Greater London Authority

**Practical completion:** 27 July 2012

**Budget:** £87,000

**Area:** Variable

**Structural engineer:** Manja van de Worp, Advanced Technology and Research, Arup.

**Manufacturers:** Plastic manufacturer: Atomplast, Santiago, Chile; steel manufacturer: JMR Section Benders, Dagenham.

**Design assistants:** Salih Topal, Daghman Cam, Andres Darko, Pallavi Sharma, Nicolo Friedman, Vincenzo D’Auria, Mark Muscat.
Statement about
the Research Content and Process

Description
Commissioned as part of London’s 2012 Olympic celebrations, Bloom is an innovative urban intervention that engages people in social play and the culture of design.

Questions
1. How can architecture be a social design experience for the user, with reference to ‘game’ design and crowd-sourcing contexts?

2. How can participatory design reflect ‘growth’ and a notion of change/life found in gardening experience (rather than a more deterministically controlled and fixed state of design)? How can universality and redundancy in a system allow for variability, diversification and imaginative projections?

3. How can a project develop under extreme time pressures and volatile conditions (constantly changing site locations and logistics during a complex event such as the Olympics in a large urban environment) by focusing on an easy-to-transport, adaptable and reusable design?

4. Which manufacturing method is most appropriate for high volumes of repetitive and light building blocks?
Methods

1. Generative open design. Bloom’s geometric system is based on the aggregation of multiple components. A custom-written software was developed that could simulate possible geometries. The final design of the cell was achieved by examining different patterns of growth and choosing the one that consistently produced compelling and structurally stable formations.

2. Structure based on principles of redundancy, frequently found within natural complex systems, and on contemporary information systems (versus the paradigm of highly optimised minimal structures).

3. Material testing, prototypes and product development through collaboration with a plastics manufacturer.

Dissemination

Exhibited at Victoria Park, UCL and Greenwich; further sites in London (Building Centre, Affordable Art Fair) and Orléans (Archilab at FRAC). Presented in lectures in Stockholm, Barcelona, London, Los Angeles, New York and Troy, USA.

Statement of Significance

One of the winners of the Greater London Authority’s Wonder competition for architectural installations to celebrate the London 2012 Olympics and Paralympics.
2 & 3
Testing possible sites during the design phase (rendering)
Bloom was commissioned by the Greater London Authority as part of the Wonder series of architectural installations celebrating the London 2012 Olympics and Paralympics. [fig.1] It is an extensive material and design urban game research project, realised in collaboration with a plastics manufacturer from Chile and structural engineers from Arup London.

Bloom is conceptualised as an urban toy, a distributed social game and collective ‘gardening’ experience that seeks to engage people in order to construct open-ended design formations using Bloom building cells. At each location, the designers constructed initial pavilions/follies to showcase the possibilities of the system. These acted as the main ‘portals’ of the game, inviting interaction and participation. People were able to manipulate the cells, adding pieces to the initial structure to alter its form or seeding entirely new ground sequences, such as urban furniture or simply unpredictable formations. The only fixed part of the design was the stable bench structure, as an initial seed condition for the visitors’ interaction, suggesting multiple connection points from which the structure could start to grow. New pieces were fed into this collective construction site depending on game intensity.

The participatory design process aims to bring phenomena of social networks and game culture to the physical environment at an urban scale. Bloom explores modes of assembly, disassembly and reusability that challenge the notions of traditional construction. Looking at the example of toys like Lego, the lifespan of the project is undetermined as it is able to adapt and reappear in many different places and on many different occasions. The collective act of coming to one place and building together becomes a shared memory for each person attending. The energy for Bloom’s design is sourced from people’s interactions. None of the pieces can do anything on its own, and only when thousands of them are put together do the game and the Bloom garden emerge. [fig.2–4]
4 Games, urban furniture and architecture

4a Combinations game: Rubik's Cube

4b Construction toy: Lego
Urban furniture: Enzis outdoor furniture by PPAG architects

Thomas Heatherwick’s UK Pavilion at the Shanghai Expo 2010
Photograph: Michael Freeman
Aims and Objectives

Crowd-sourced design
It is impossible to forecast what people will do with such a game, since the game relies highly on contingency. There is a universality to the building cells, but they also have embedded biases and information encoded into them. No matter how randomly participants connect the cells, they will always exhibit recognisable behaviours. Due to the flexibility and resilience of building cells, the ‘rules’ of the game can be bent; cells can be twisted to follow different shapes and emerge with new configurations. [fig. 5–9]

Adaptability/resilience
Bloom has been designed as a system that is highly adaptive to different site conditions, variable number of participants, available budget and myriad possible outcomes. Being aware of the volatility of logistics and conditions involved in an event like the Olympics, the flexibility and resilience of the design was an imperative (see Andrasek 2012: pp. 36–45). [fig. 10 & 11]

Growth logics
In its basic form, Bloom is a modular construction system capable of generating complex cellular structures utilising standardised units. Simple combinations between cells can produce different sequences. For example, each possible connection has a notation (A, B, C ...), and by following simple letter combinations different sequences are produced. Only by playing does the actual ‘design’ emerge. The final piece is a collective act of search and play. [fig. 13 & 14]

Software
Bloom Games developed a custom-written software in Processing and Rhino testing recursive growth-based algorithms such as L-systems and DLA (diffusion-limited aggregation). Through this design-search environment it was possible to study various growth (‘blooming’) sequences to predict the characteristic morphological behaviours of the system. [fig. 12]
7–9
Play!
5 - ASSEMBLY / SOCIAL INTERACTION

Aggregation on existing structure / Prototypes

The bench is an initial seed for the users’ interaction. It suggests a multiplicity of connection points from which the structure could start growing. We suggest an initial aggregation developed from a that would show the potentiality of the pattern, but people can add more pieces in different areas and remove some as well, to alter the general shape.

Option 1: Aggregation with metallic benches
Aggregation with 1000 Bloom Cells

BLOOM
UCL

Option 1: Aggregation with metallic benches
Aggregation with 1000 Bloom Cells
Testing different scale of possible sites and different configurations (renderings)

Bloom combinatorics develop as custom-written software in Processing and Rhino
Bloom: Distributed Urban Game

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Bloom structures

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Play!
Questions

1. How can architecture be an interactive/social design experience for the user, with reference to ‘game’ design and crowd-sourcing contexts?

2. How can an interactive/participatory design reflect a notion of change/life found in gardening experience and promote ‘growth’ through collectively derived design, rather than a more deterministic control of design (e.g. pre-planned drawings and a fixed state of design)? How can universality and redundancy in a system allow for variability, diversification and imaginative projections (see Andrasek 2012: pp. 36–45)?

3. How can a project develop under extreme time pressures and volatile conditions (constantly changing site locations and logistics during a complex event such as the Olympics in a large urban environment) by focusing on an easy-to-transport, adaptable and reusable design?

4. Which manufacturing method is most appropriate for high volumes of repetitive and light building blocks?
16 & 17
Collective play
Context

1. Architectural designs of play such as those of Constant Nieuwenhuys (New Babylon, 1959–74) and discussions of social engagement and participatory art by critics (Bishop 2012). [fig. 15–17]

2. Game cultures, building units and collective materiality found in physical toys (Lego, Rubik’s Cube) and video games (Minecraft, World of Goo), as well as in architecture (Thomas Heatherwick’s Shanghai Expo pavilion, 2010) where complexity is achieved out of the accumulation of simple elements.

3. Biological cellular growth and its capacity for diversification (Longo and Montévil 2012). Bloom engages with current architectural topics of variance and adaptability in biology and morphogenesis from a point of view of discreteness rather than continuum. Bloom works with a single component type, whereby the crucial factor for diversification comes from randomness generated by the participants’ play, interaction, skill and imagination.

Methods

Cell anatomy

The Bloom cell has three possible connection points. Through the asymmetry of their positions, various types of spiralling connections emerge. Crucial to the cell design were the relationships of the vectors of connection, based on small variations from the shared axis, which result in gradual spiralling if the cells are accumulated consistently.

Future emergent behaviours are pre-seeded into the system by encoding information within the anatomy of a cell. Some combinations block possible future moves and lock users into taking a specific route. In this way, the project encourages different users to take decisions on how to reach a specific goal or build a resilient structure. [fig. 18 & 19]
Prototyping and test play

In order to develop a system that could be truly engaging, laser-cut timber prototypes were produced and made available to test through play. Students without any pre-knowledge of the Bloom system were asked to ‘play’ and ‘design’ with the pieces freely. The construction time was approximately 30 minutes, resulting in a formation of $1.5m \times 1.2m \times 0.7m$. Students’ feedback suggested that the proposed cells were easy to assemble and produced beautiful and structurally stable results rapidly. [fig. 20]

Material and shape testing

In order to ensure public safety and risk-free use of the Bloom cell, the design was tested through 1:1 3D printed prototypes. The prototypes were not produced in the final plastic material but helped to visualise and understand the shape and possible weight of one of the cells.

Bench design

Designed as a modular element, six long benches were produced to allow users to create structures that could connect them. In each location, the benches served as the centre of the Bloom garden. Given their modular nature, the number and length of the benches can vary to adapt to specific site conditions. [fig. 21–27]

In order to deploy an initial stable shape, bench elements are designed to act as structural anchors for the larger Bloom pavilions/sculptures and to diversify the use and aesthetic of the pavilions. The bench design language is much simpler, using parametric linear arrays arranged in a spiralling fashion, contrasting with other ‘blooming’ sequences with higher degrees of randomness. Benches are designed as self-supporting structures developed off site and could be positioned onto any flat surface without further need for drilling or foundations. Two structural scenarios, one for connected benches and one for a single bench, were developed with Arup Engineers. [fig. 29 & 30]

Cell manufacturing

The Bloom cell was manufactured through a plastic injection mould process, carried out by the manufacturer Atomplast, based in Santiago, Chile. Atomplast partially sponsored the project, which allowed for the cost of the injection mould to be reduced drastically. The process of creating a matrix for injection is costly, but once created, extremely high volumes of identical components could be manufactured quickly at a very low cost. [fig. 28]

Manufacturing constraints affected the development of a design system that could use the same cell in different combinations to allow for highly diverse outputs. The rigidity of the built assemblage would come from the aggregation of elements rather than the strength of an individual unit, which is in itself weak and light. The rigidity of the system emerges through ‘redundancy’ when many elements are brought together.
First prototypes and test play by non-experienced users. Time-lapse of construction: 20 minutes with 300 pieces.
Bench on site:
Metal structure + Plastic component array
No foundations, weights between supports.
3.5m x 2m boundary

Support plates
Curved metal bars
Plastic components
3.5m x 2m bench
Bench design

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Bench design

25–27
Bench design
Reusability and adaptability

The Bloom cell was designed to be a desirable object, which Bloom participants could take home as a souvenir of the London 2012 Olympics and Paralympics. The collective act of coming together and building something becomes a shared memory for each participant. By serving as a symbol of the event of participation in such collective play, the Bloom cell is meant to provoke the seeding of new structures. Bloom’s mode of assembly, disassembly and reusability in new configurations in different places challenges notions of traditional construction.

Health and safety

The Bloom cell is made out of 100% recyclable PET plastic – material certified for food products, with the highest standards. Each cell is light, weighing approximately 90g. The plastic is strong, flexible and can be manufactured in many different colours and opacities. The manufacturer is conducting tests to add photo-luminescent pigments that will create glowing effects at night. The edges of the components are rounded, easy to handle, and child-safe.
Connected bench unit stress and load test
Single bench unit stress and load test
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Bloom pavilion and game in Greenwich

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Bloom at Affordable Art Fair, London

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Bloom at Global Design NYU, London
Dissemination

Installations

Olympic location:
Victoria Park Live Site, 27 Jul – 12 Aug 2012. [fig. 1]

Paralympic location:
Cutty Sark, Greenwich, 28 Aug – 12 Sep 2012. [fig. 31]

Further venues:
Affordable Art Fair, Battersea and Hampstead, London, Oct 2012. [fig. 32]
Archilab 2013, FRAC (Le Fonds Régional d’Art Contemporain), Orleans, Oct 2013

Invited talks

Bloom has been the subject of numerous invited international talks, including:
Institute for Advanced Architecture in Catalonia (IaaC), Barcelona, Feb 2013
Material Gap 2013 and Pecha Kucha, Stockholm, Mar 2013
Rensselaer Polytechnic Institute (RPI), Troy, New York, Mar 2013
José Sanchez, ‘Design = Play’, University of Southern California, Los Angeles, Mar 2013

Bibliography

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