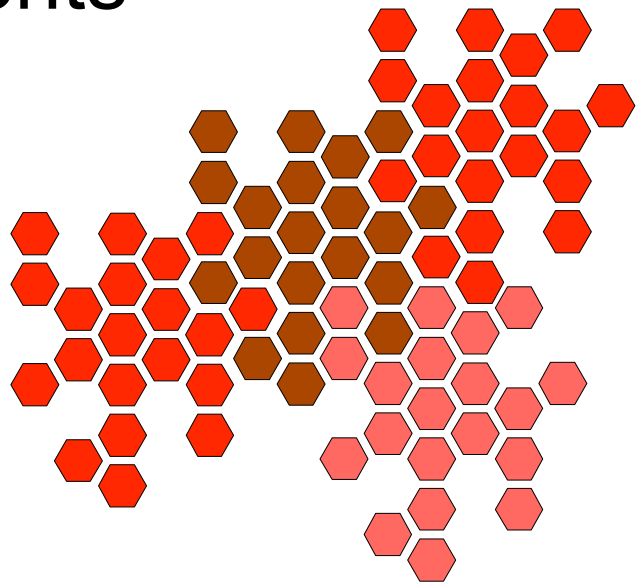
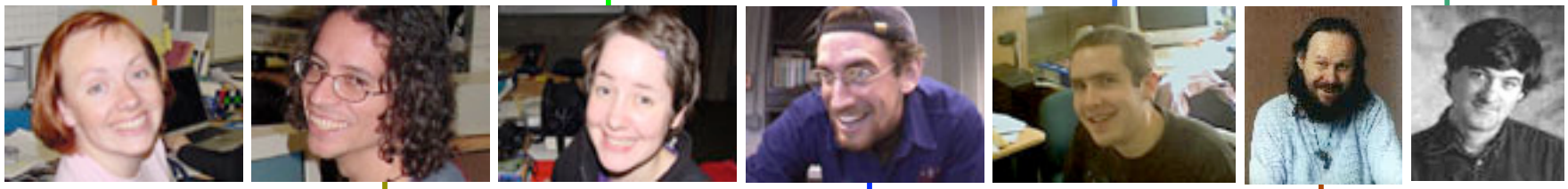
Self Organizing Force Sensors for Interactive Environments



Introductions



interaction design centre

University of Limerick
Ollscoil Luimnigh

Media Lab Europe
The European Research Partner of the MIT Media Lab

Dynamic of Weight in Human Movement

Richness of expression in x, y & **z**

weight / force / effort

Goal

A sensor network for detecting dynamics of weight transference

Beneficiaries

- Athletes & Trainers
- Actors & Animators
- Dancers & Musicians

Students of human movement & physical expression

Scenario

Siobhan Tierney

32-year-old legal consultant from Kilkenny.

Has Multiple Sclerosis, falls while walking.

Learning Tai Chi for balance.

Wants visualization aids responsive to her own practice.

Genealogy

Magic Carpet
Paradiso et al.

Litefoot
Fernström et al.

Ztile
&
SOS

Introducing Z-Tiles

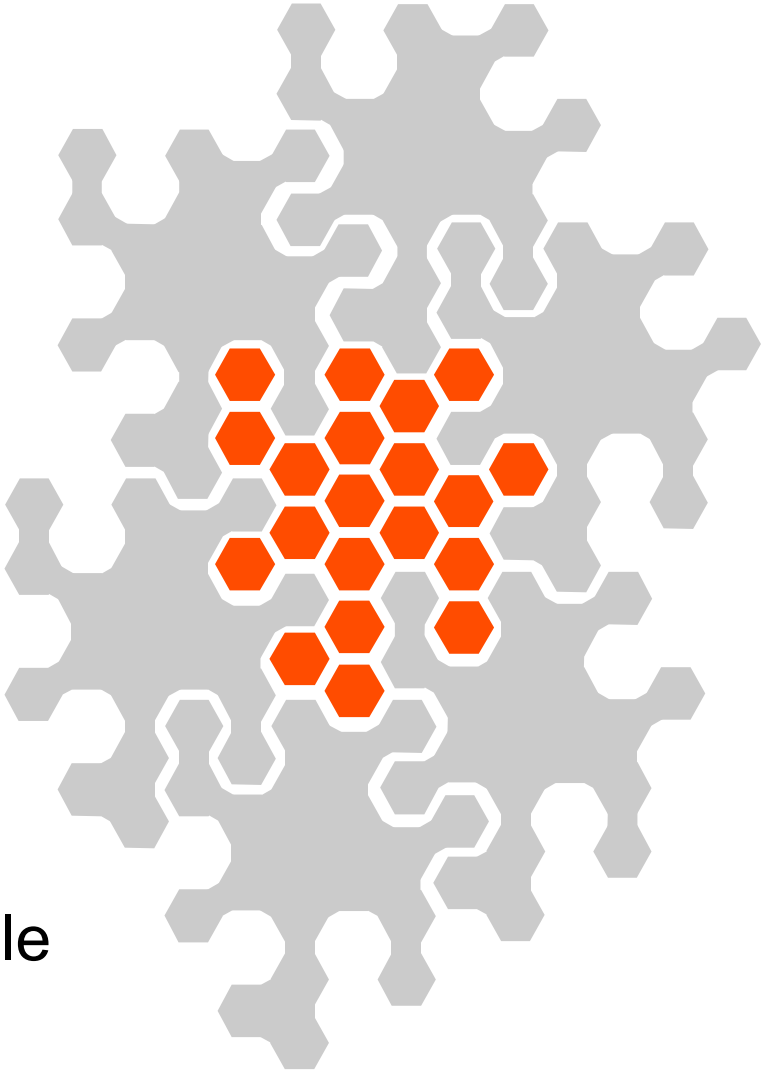
Interlocking

Self-Holding

Self-Organizing

Scalable

Durable



Outline

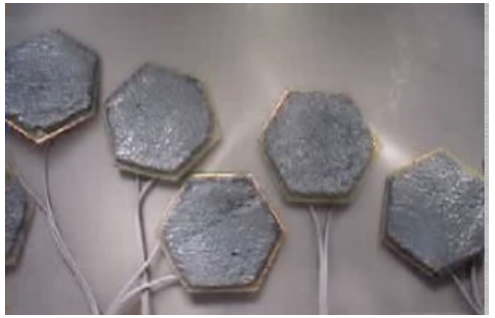
- Sensor Development & Testing
- Self-Organization
- Implementation
- Future Work



Prexel Development

Silicone Rubber
+
Carbon Granules

+

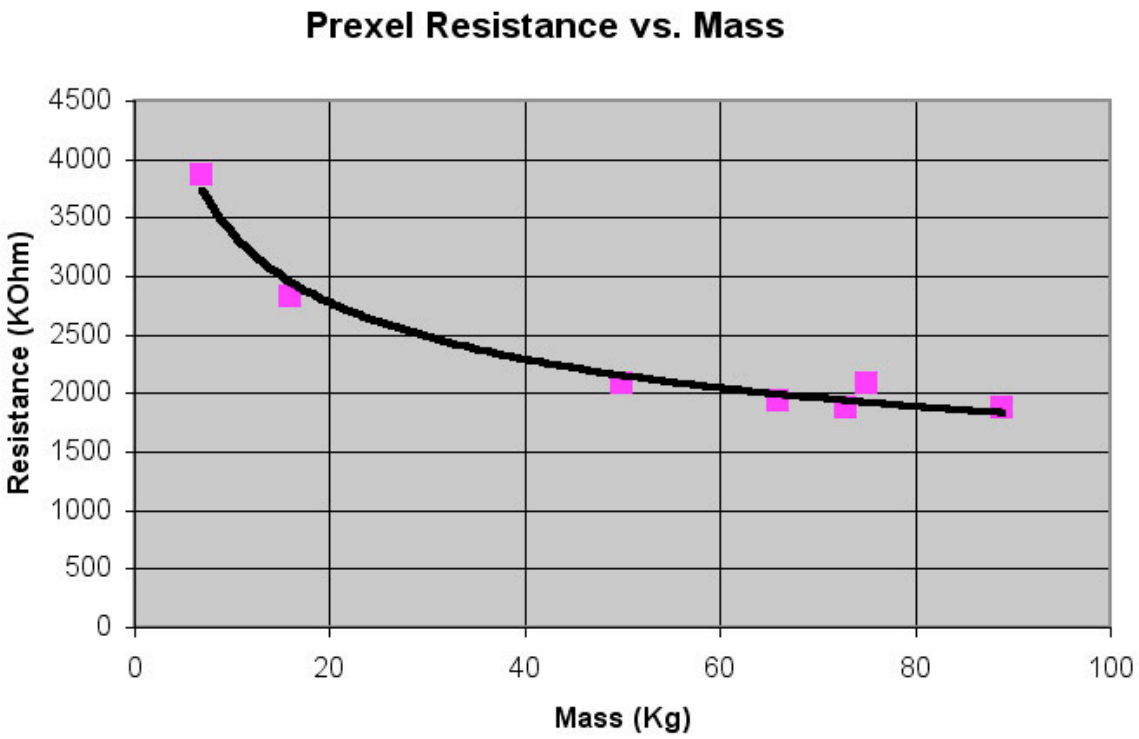


“Prexels”

Prexel Testing

Dynamic Range

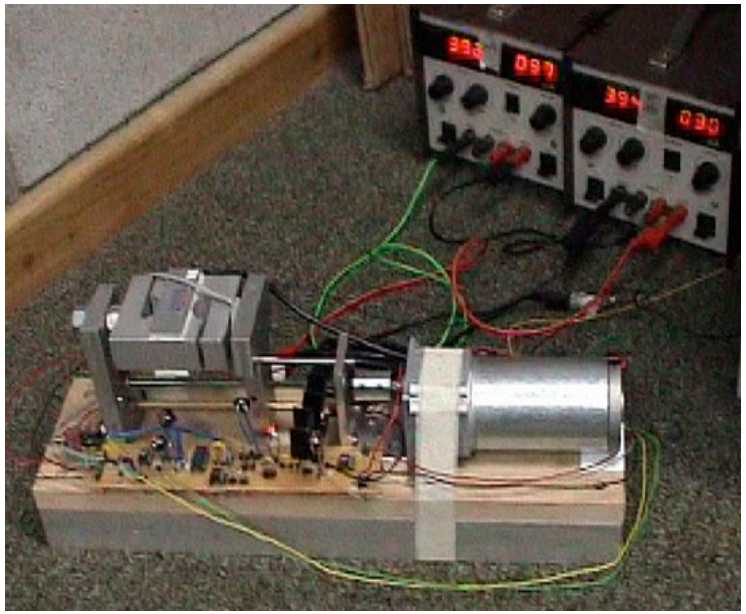
~ 30 to 500N



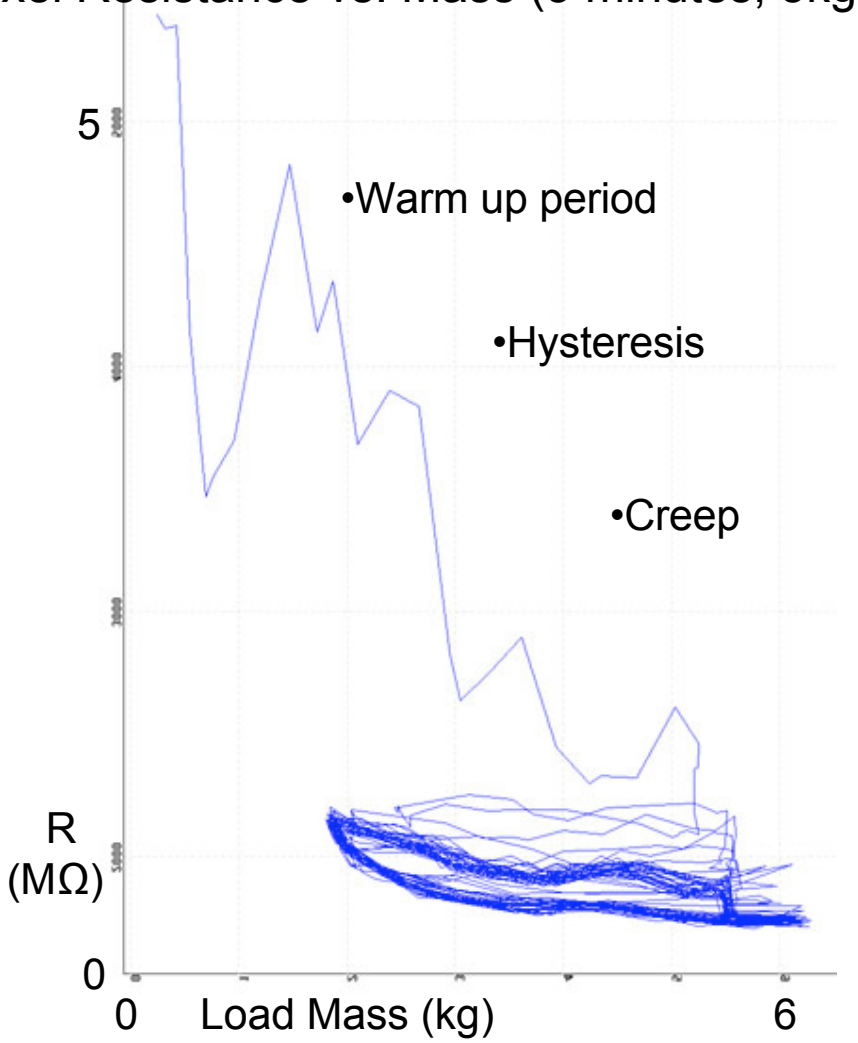
power function: $y = 6400\ x^{-.3}$

Prexel Testing

Repetition

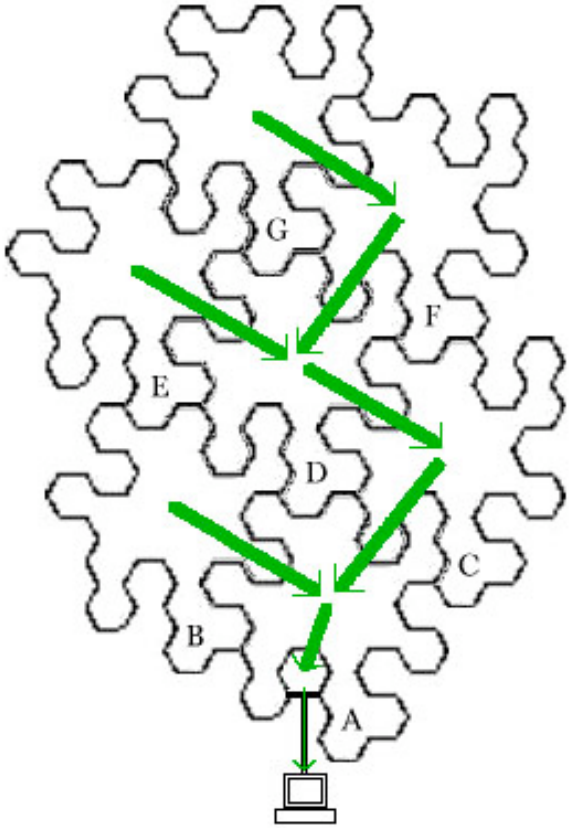


Prexel Resistance vs. Mass (3 minutes, 5kg load)

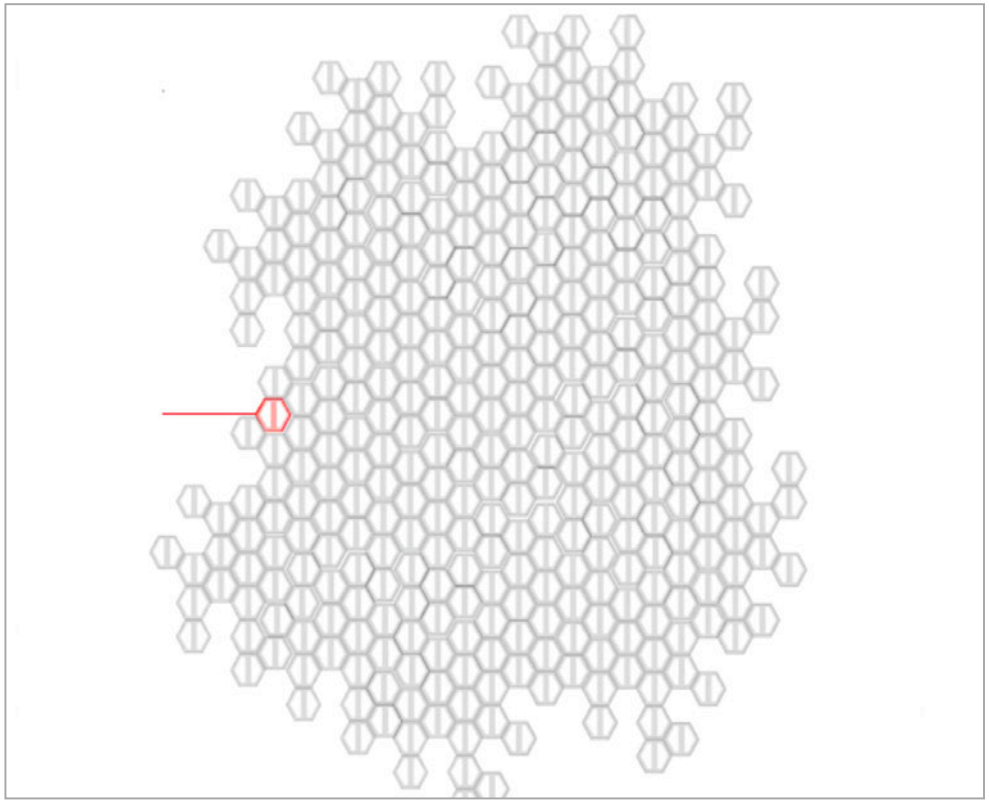


Self-Organization: Overview

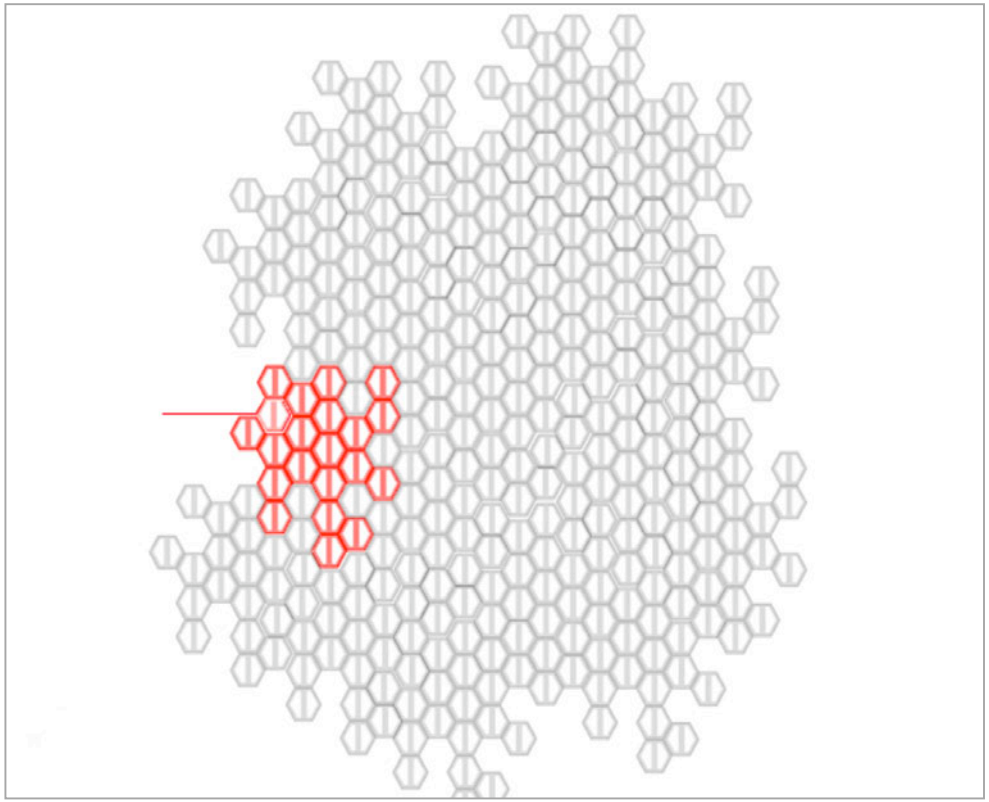
- One external connection
- Tiles find own position & route data via local communication
- Data sent by shortest route
- Routes can change



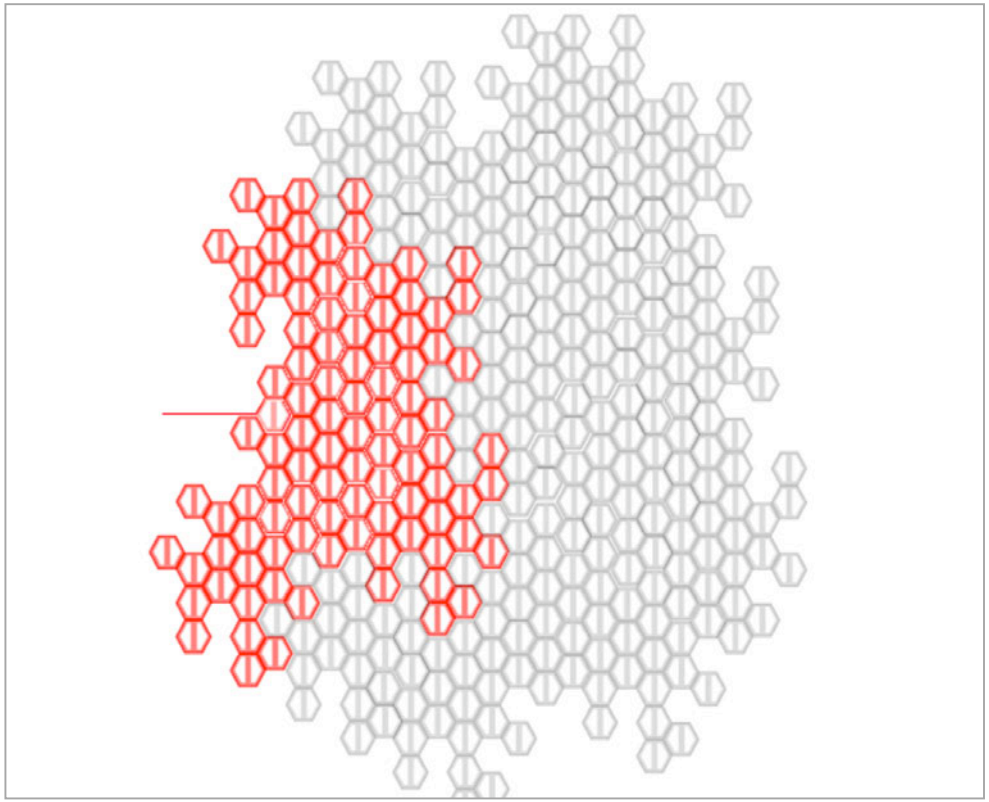
Self-Organization: Network Formation



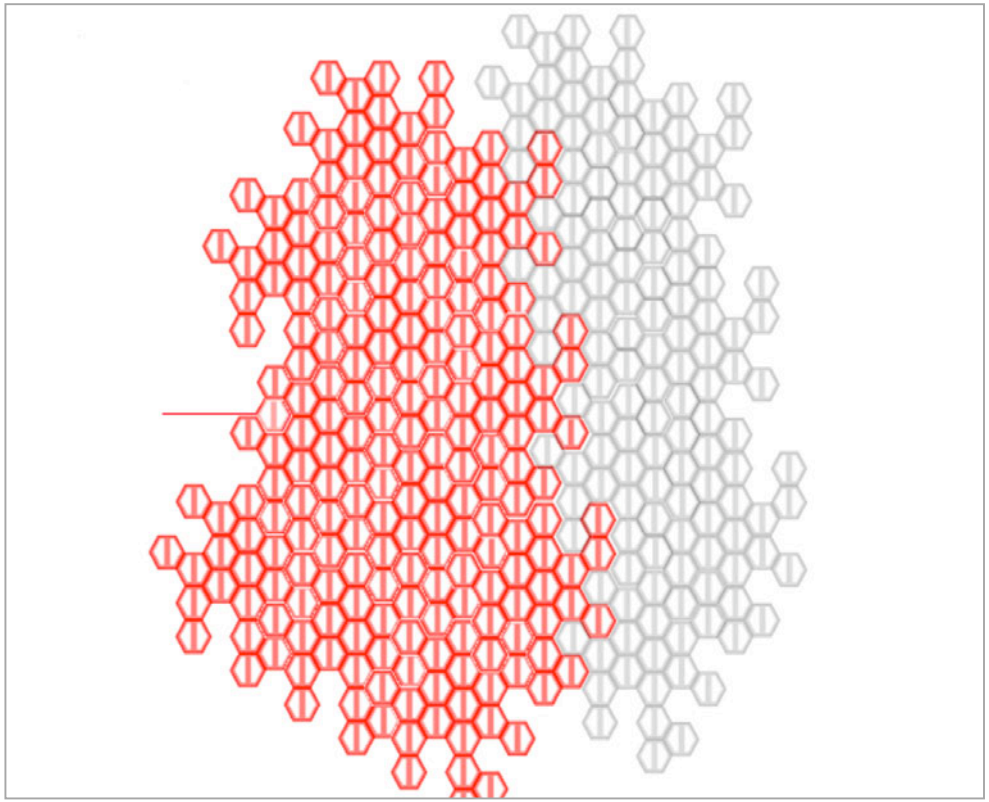
Self-Organization: Network Formation



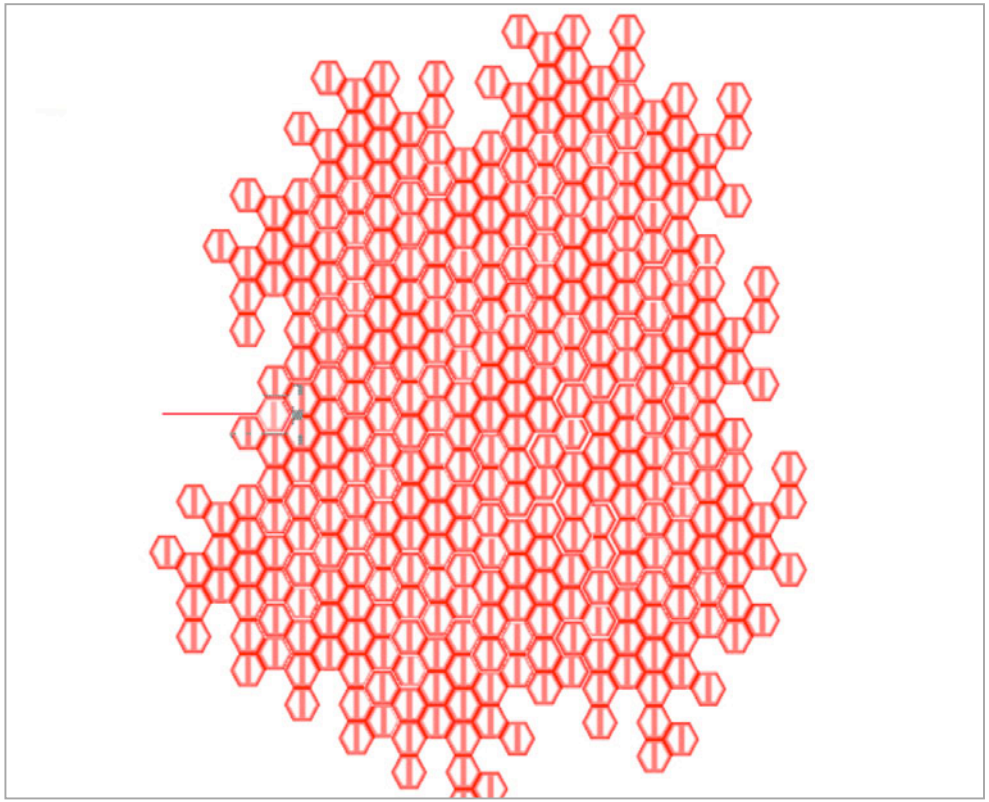
Self-Organization: Network Formation



Self-Organization: Network Formation



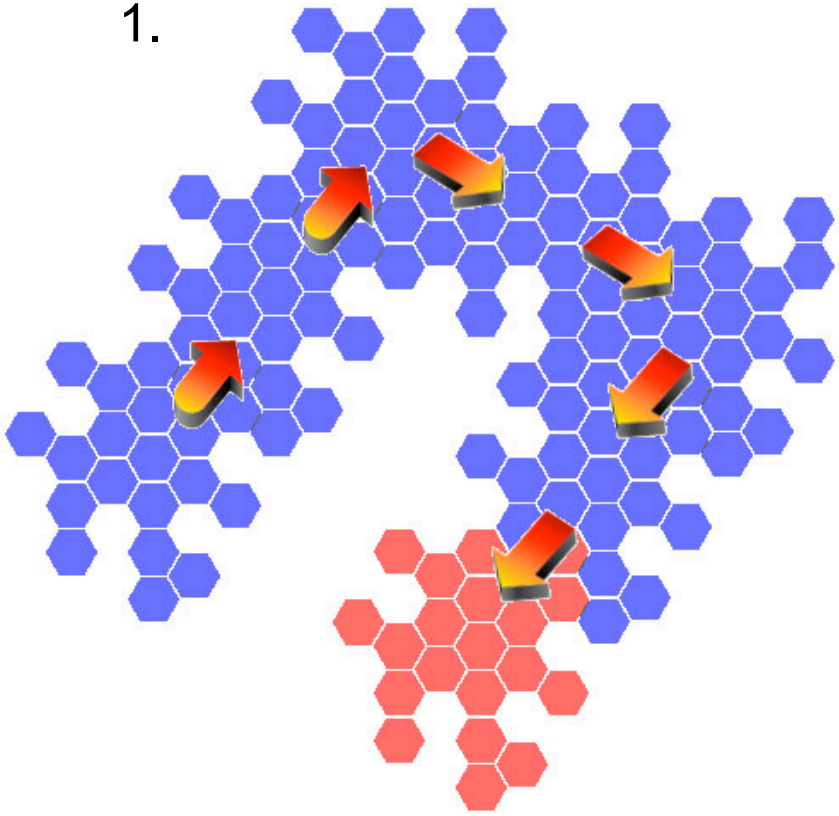
Self-Organization: Network Formation



Self-Organization

Addition

1.



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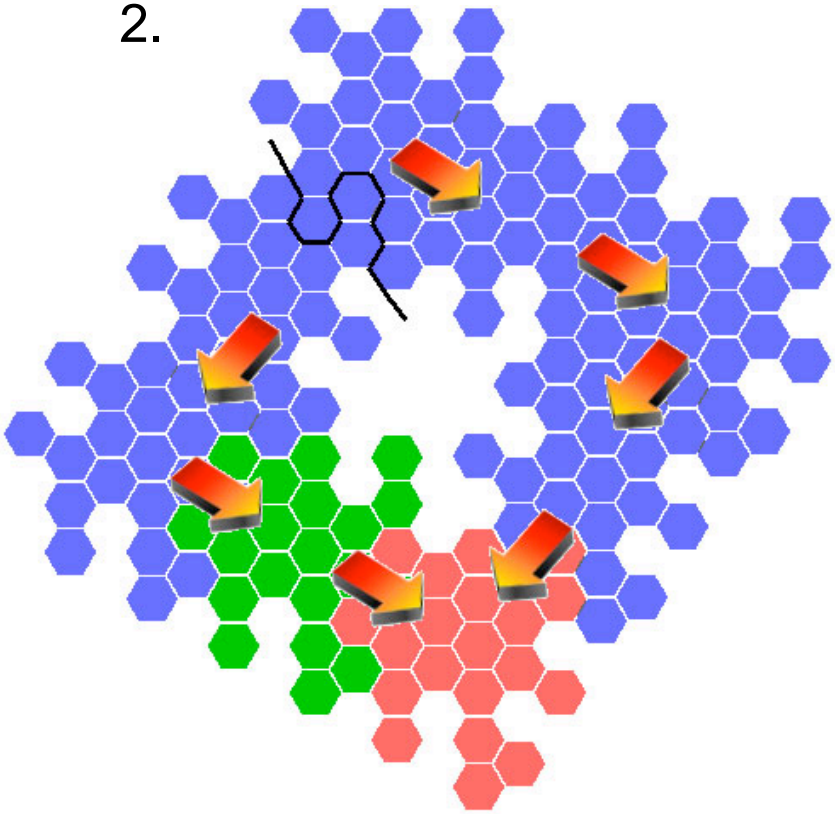
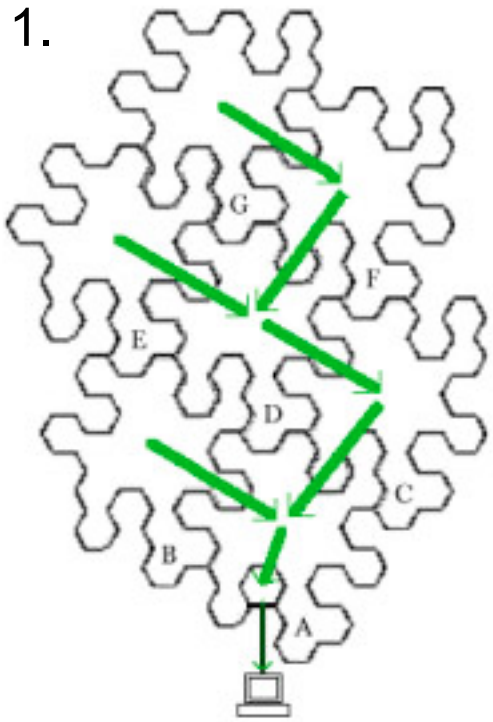


Self-Organization

Removal

1.



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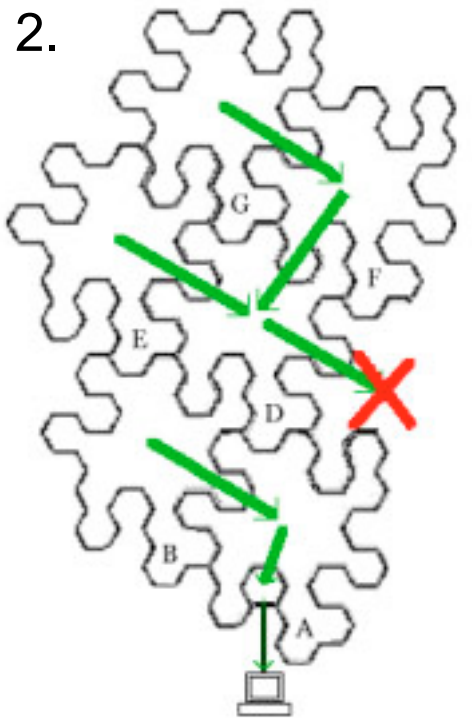
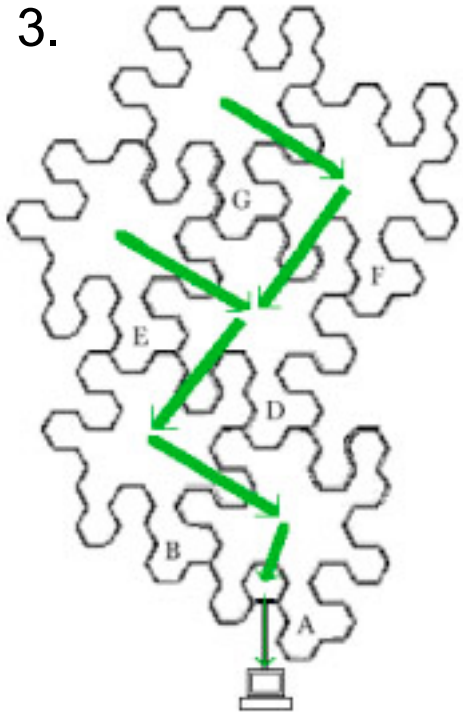


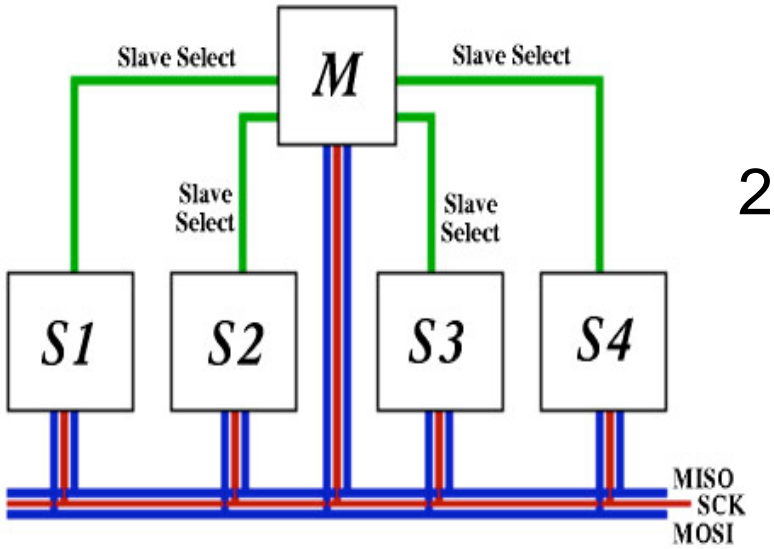
3.



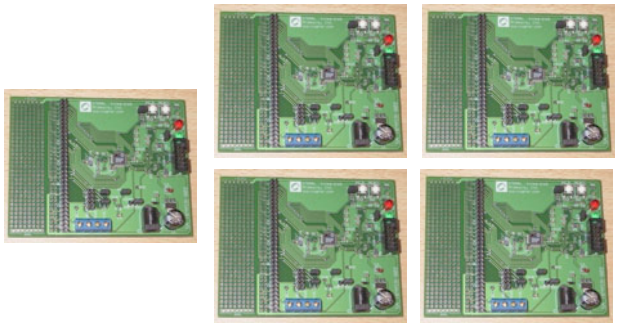
Implementation

5 µControllers:

- Master - Force measurements
- Slaves - Communications

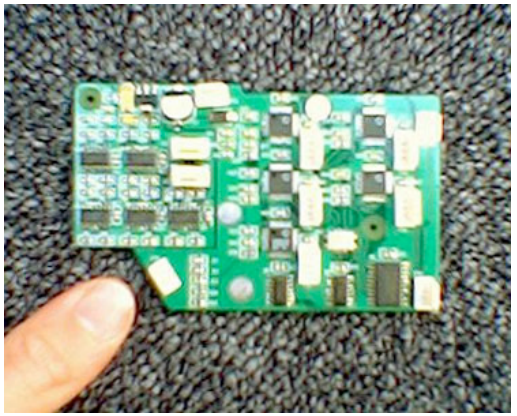


1st Prototype: 5 Cygnal 8051 EVBs

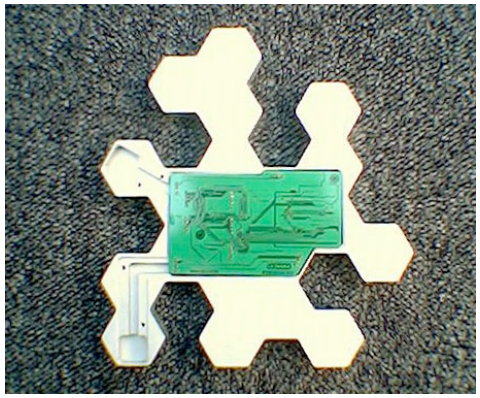


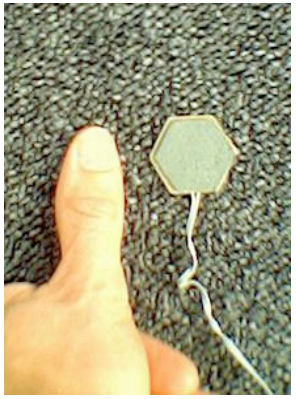
2nd Prototype:

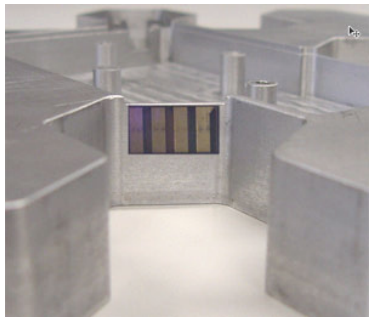
Custom PCB

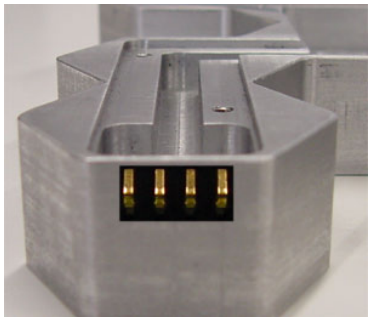


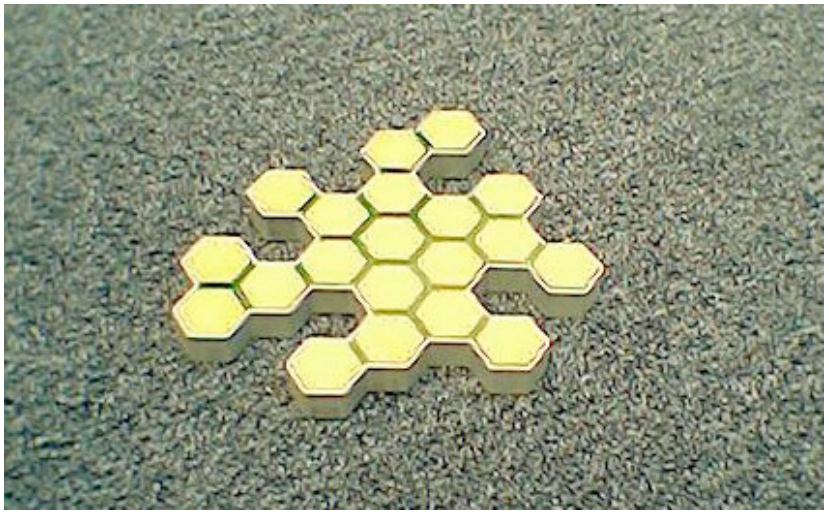
Implementation

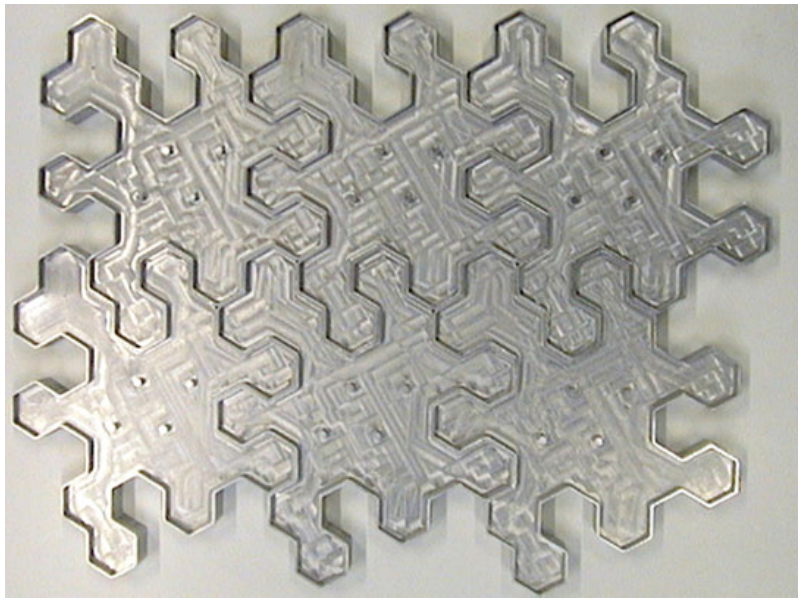












Future Work

Tile Assembly & Debugging

Floor-to-CPU Connectivity

Data Distillation & Pattern Recognition



Acknowledgements

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- Inpact Microelectronics

Donal Ryan

- Ryan Prototyping

Josh Lifton

- MIT Media Lab

HEA

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Questions?
Comments?
Suggestions?