



Firefly

The Vision

The Firefly project envisions a world where every light source has an integrated computer, capable of self-organizing with its neighbours to form two and three dimensional ad hoc displays.

In essence, blurring the boundary between light and pixels.

More specifically, the project aims to develop:

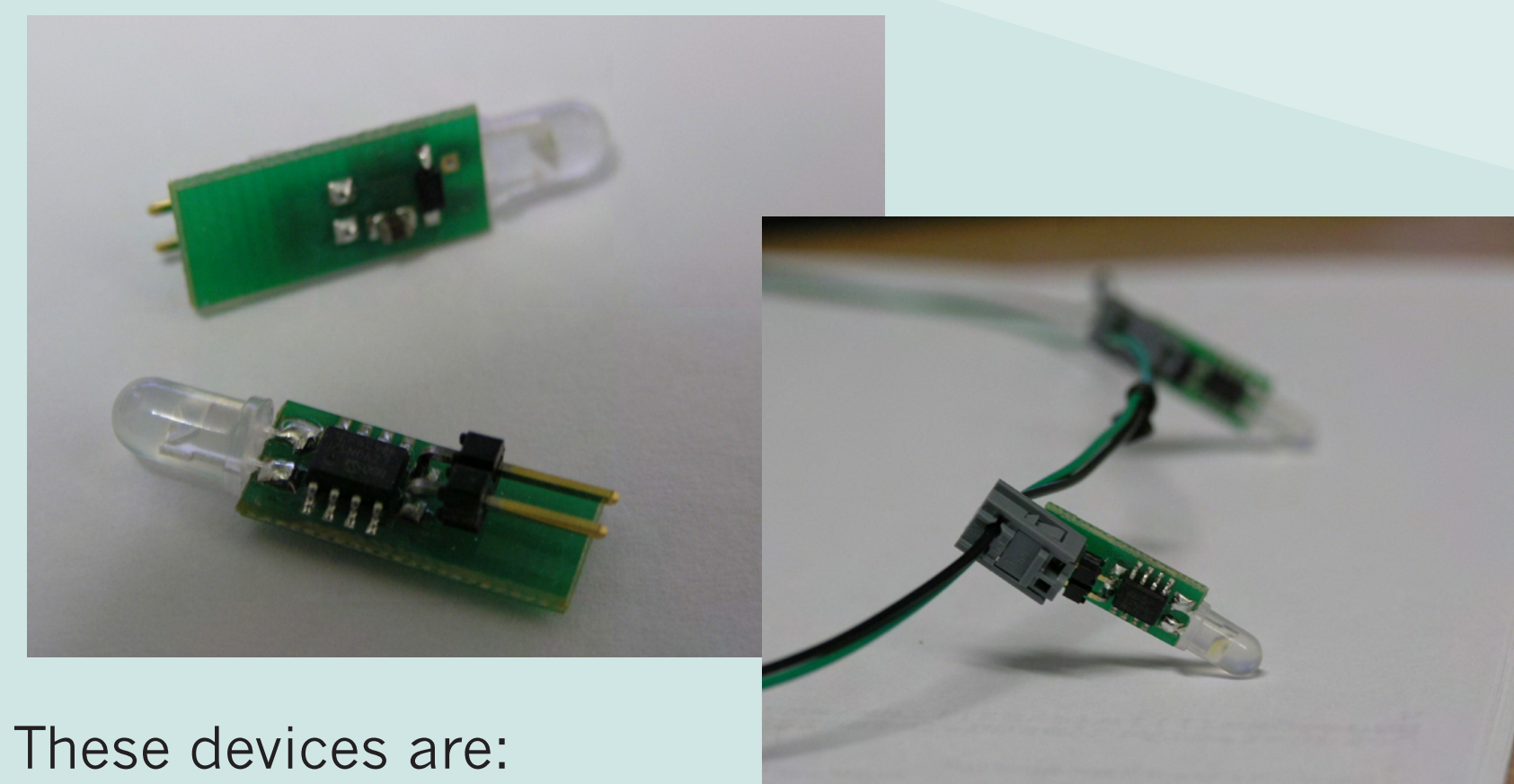
- **smart lighting devices** capable of communication and self organizing behaviour
- **scalability** to enable the interoperation of thousands of such devices
- **calibration** of devices into coherent 2D/3D displays
- **modeling** and application development support

The goal of the project is to investigate the feasibility of this concept through applying autonomous computing concepts to display technology at a fundamental level.

We envision the **spray on display surface** as the ultimate vision for Firefly!

Technology

Lighting Elements. Every LED is integrated with a small microcontroller...

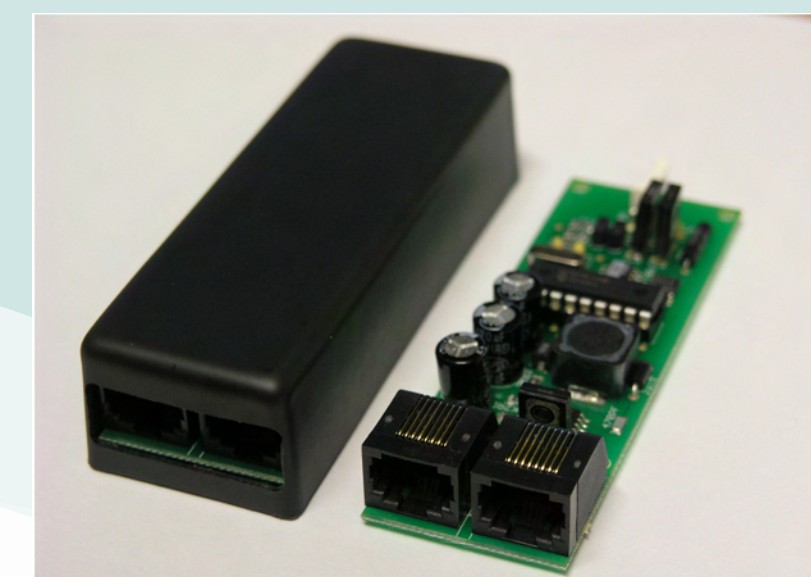


These devices are:

- 22mm x 9mm
- individually addressable
- self-addressing
- powered and controlled through a two conductor powerline network
- topology independent
- 30 frames per second update
- only **four** hardware components...

Control Elements.

Interconnect networks of lighting elements to form larger displays.

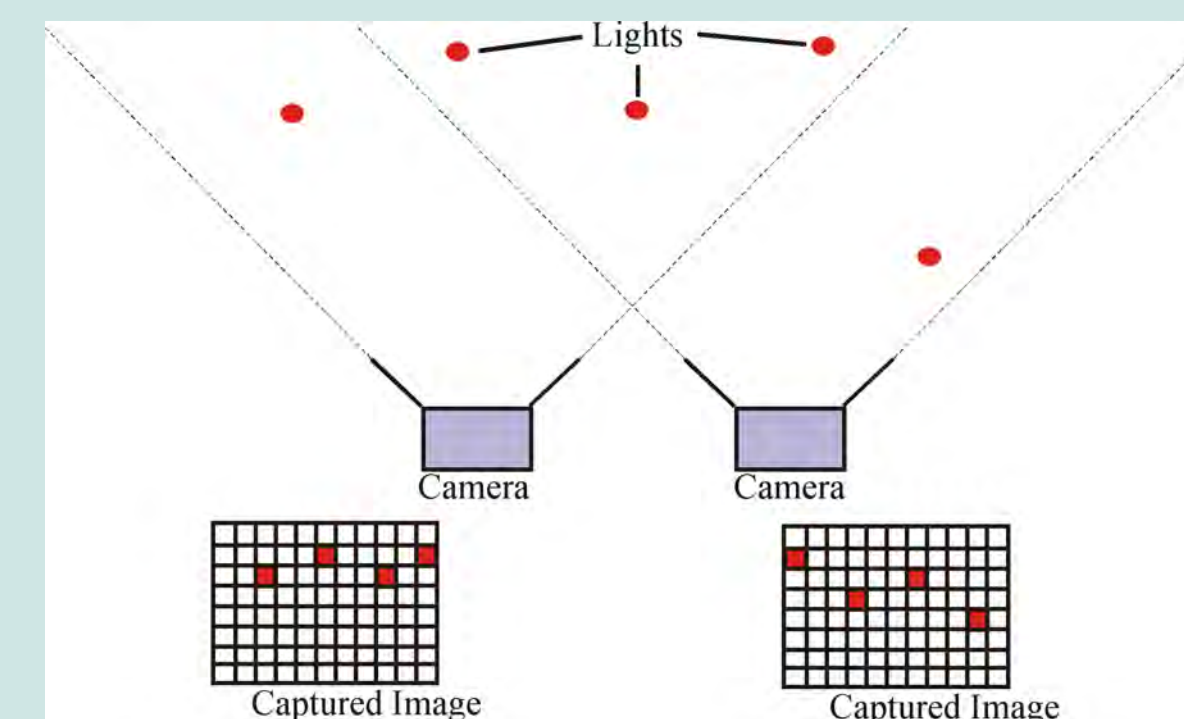


- 500kbps uplink
- daisy chained
- form hierarchies to scale
- current sensed output

Ad-Hoc Deployment and Visual Calibration

Lighting elements can be deployed in any configuration to suit the environment... Either in the field, or at time of manufacture.

Location of lighting elements is determined through computer vision techniques.

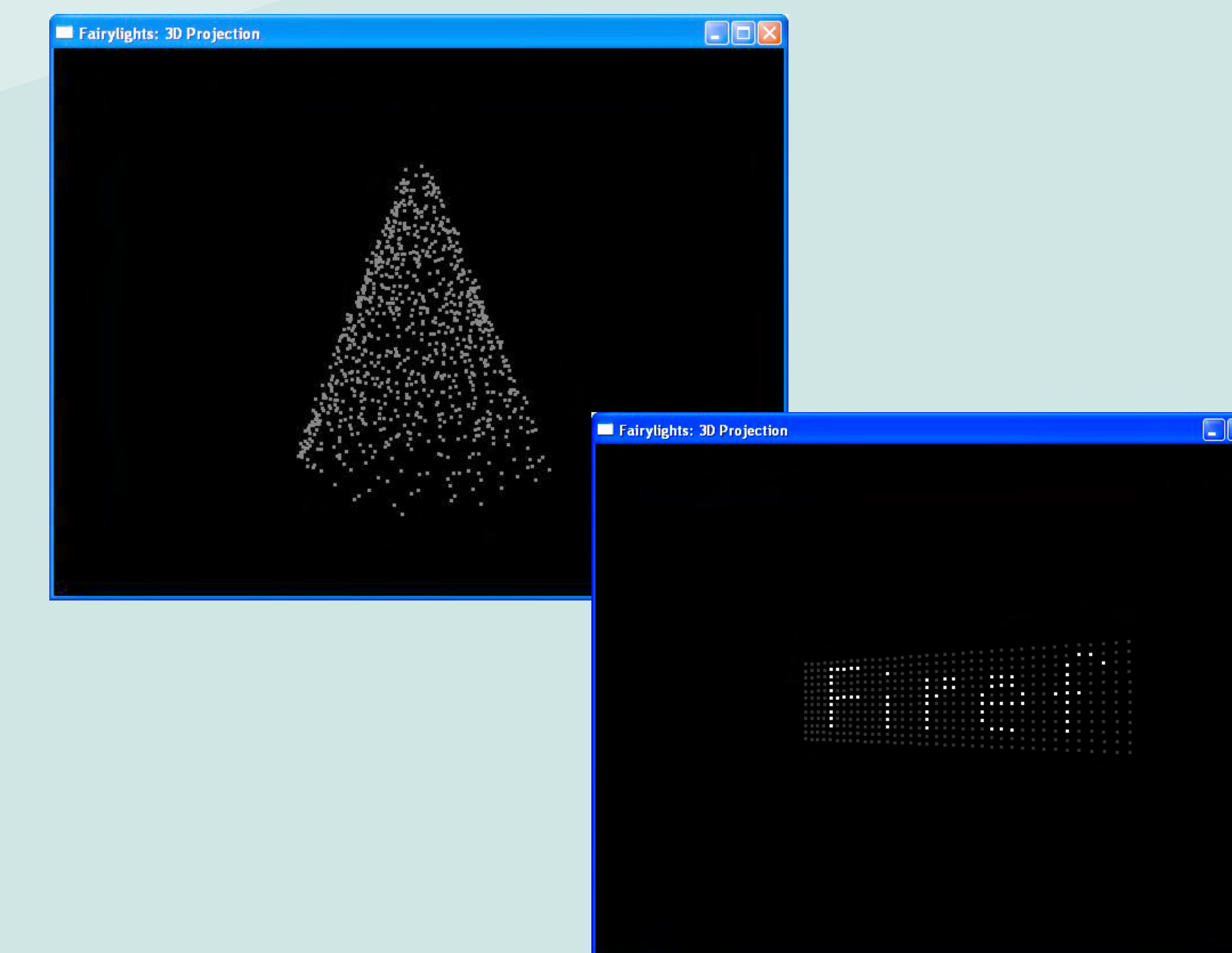


Each light beacons its address visually via a robust visual code. Digital cameras in the environment can then identify and locate the lights using similar techniques to those applied in CDMA networks, up to 250 lights can be calibrated simultaneously.

Multiple camera angles allow the localization of lighting elements in 3D space through triangulation and linear optimization techniques...

Modeling

Once calibrated, a digital model of the deployment is formed, that represents the location of all the light sources.



The Firefly API then provides software support to enable easy development of applications targeted at these displays, via:

- a Microsoft .NET based API
- support for 2D planes, 3D wrapped surfaces and 3D dense deployments
- seamless integration to Firefly hardware
- primitives mapped into 3D space, that can be moved, animated and deployed on Firefly deployments in real-time
- 3D model slicing to form directed 2D faces
- real-time visualization and simulation

Applications

There are many potential application domains for this technology, ranging from:

- art installations in malls and hotels
- architectural and festive lighting
- ad hoc deployments in public places, such as stadiums
- interactive exhibits
- miniaturized 'holographic' displays
- smart environments
- ubiquitous computing

Moreover, this technology encourages incremental deployment - as more devices are deployed, the better the effect.

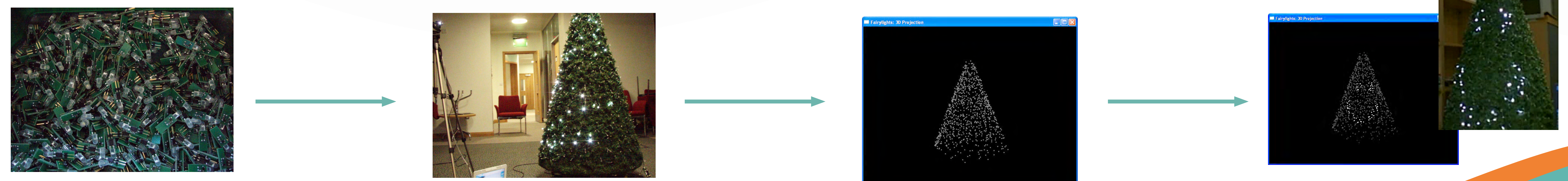
Finally, artists see this technology as a potentially new medium, with the ad-hoc deployment being key to public engagement.

We are currently active in evaluating large-scale deployments, and developing higher definition displays.

Contacts

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