Focus on Cyber-data: dealing with data complexity?

Panel on DATA ANALYTICS / CYBER

Sandjai Bhulai (s.bhulai@vu.nl)


Data industry under scrutiny


Tech moves faster than laws


Behavior changes faster than norms


Data deluge changes everything

SIEMENS
Ingenuity for life

PANEL DATA ANALYTICS – CYBER

Cyber Security for Industries

Dr. Rainer Falk
Principal Key Expert

Digitalization at Siemens – Productivity lever for our customers

SIEMENS
Ingenuity for life

- Cooperation and mobile IT
- Smart data and analytics
- Cloud technologies
- Connectivity and Web of Systems
- Cyber security

Improved productivity, shorter time-to-market

Greater flexibility and stability

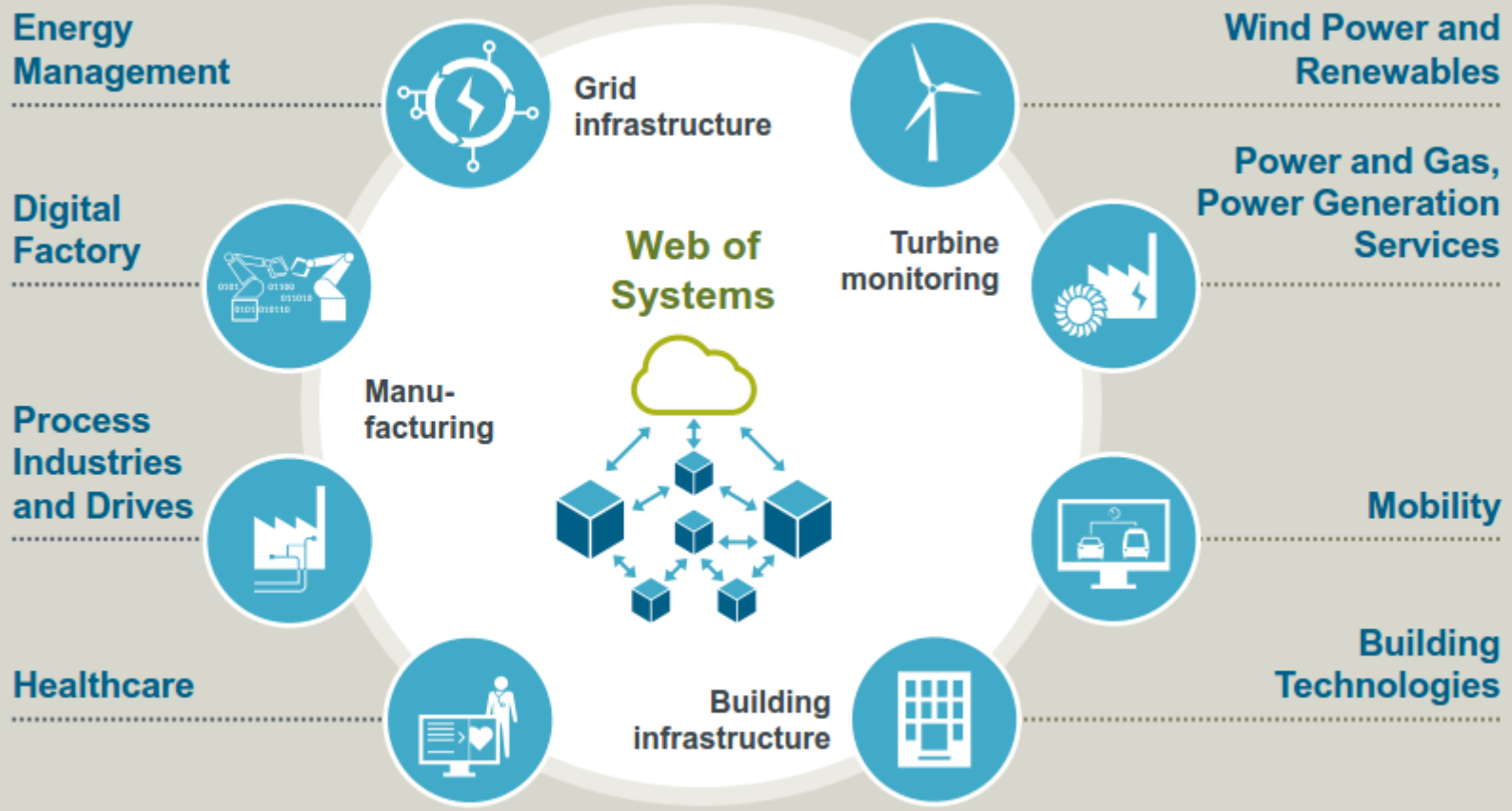
Higher availability and efficiency

Design and engineering → **Automation and operation** → **Maintenance and services**

Linking the virtual and real worlds along the entire value chain of customers

	Vertical software	Digital services
Revenue, FY 2015	€3.1 billion	€0.6 billion
Profitability	++	+++
Market growth	+9%	+15%

Concept for the Industrial Application of the Internet of Things – The Web of Systems provides security for critical infrastructure



- Siemens believes the Internet of Things has tremendous potential
- In critical infrastructure, customers have much higher requirements regarding reliability, service life and data protection
- For this reason, in a Web of Systems the data is processed locally
- This ensures that the knowledge and the intellectual property of our customers remain protected
- Siemens is already using this technology in many projects today

Concrete examples of our work – Core elements for the success of Digitalization

Intelligent industrial networking via Internet

We extended the concept of the Internet of Things for industrial applications: A digital networked world full of devices which are connected to the Internet has an influence how we control factories or critical infrastructures. Our Web of Systems makes these interactions reliable, safe, durable and can be used to "digitally toughen up“ existing plants.

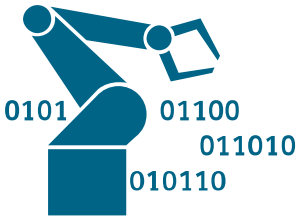
Further information is available here: Pictures of the Future

Optimizing maintenance intervals

From trains to turbines, a vast range of machines generate and transmit data every second. With the technology platform Sinalytics we extract valuable information from this data to provide benefits for our customers. CT is responsible for this platform which brings together all of the technological components needed for data integration and analysis, connectivity, and cyber security.

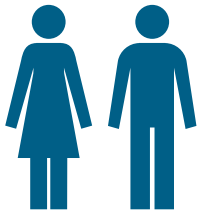
Further information is available here: Pictures of the Future

Megatrends – Challenges that are transforming our world



Digitalization

By 2020, the digital universe will reach **44 zettabytes** – a tenfold increase from 2013.[1]



Demographic change

The earth's population will increase from 7.3 billion[2] people today to **9.7 billion**[2] in 2050. Average life expectancy will then be 83 years.[2]

Climate change

According to scientists, in the summer of 2016, the Earth's atmosphere had the **highest CO_2 concentration** in 800,000 years.[4]

Urbanization

By 2050, **70 percent of the world's population** will live in cities (today it's 54 percent).[3]

Globalization

The **volume of world trade** nearly **doubled** between **2005 and 2014.**[5]

Sources:

1. IDC, The Digital Universe of Opportunities: Rich Data and the Increasing Value of the Internet of Things, April 2014
2. United Nations, Department of Economic and Social Affairs, Population Division (2015). World Population Prospects: The 2015 Revision, Key Findings and Advance Tables. Working Paper No. ESA/P/WP.241
3. United Nations, World Urbanization Prospects. The 2014 Revision, New York, published 2015
4. SCRIPPS INSTITUTE OF OCEANOGRAPHY, "The Keeling Curve", July 30th, 2016
5. UNCTAD Statistics, Values and shares of merchandise exports and imports from 1948 to 2014, November 10, 2015

Theme

- Is big data analytics necessarily bad for privacy?
- Can privacy be protected in big data analytics?

Panel on Data Analytics / Cyber

10 October, 2016

George Yee, Aptusinnova Inc., Carleton University

Big Data Statistics

- Google is >1 million petabytes in size and processes > 24 petabytes of data a day (thousands of times the quantity of all printed material in the U.S. Library of Congress)
- 90% of the data in the world today has been created in the past two years
- In 2020, the amount of digital data produced will be > 40 zettabytes, which is the equivalent of 5,200 gigabytes for every man, woman and child on planet earth

1 Gigabyte = Approximately 1 full-length feature film in digital format;
1 Petabyte= One Million Gigabytes or a Quadrillion Bytes;
1 Zettabyte = One Trillion Gigabytes or One Million Petabytes


When we get home, remind me to update my Privacy settings.
Google presents
THIS IS YOUR LIFE
www.ITworld.com

Privacy Problems with Big Data Analytics (BDA)

- Analytics → Privacy breaches → embarrassment, lost jobs
  - Retailers predicting personal details, e.g. pregnancy due date
  - Resultant marketing
  - Solution? Avoid using discovered information?
- Anonymization could be defeated
  - Identification possible by combining anonymized data sets
  - Solution? Modify data sets before combining? Rules for combining data sets?

Privacy Problems with BDA

- Data masking could be defeated
  - Incorrect use of private data masking by organizations new to data analytics
  - Solution? New policies and procedures for using data masking?
- Unethical actions from interpretations
  - Interpretations from private data lead to unethical actions
  - Increase price of Epipen
  - Solution? Review actions thoroughly before implementation?

Privacy Problems with BDA

- Results of BDA not accurate
  - Flawed data models and algorithms
  - Can result in wrong conclusions that can harm an individual, e.g. wrong information about a person's medical history
  - Solution? More testing of algorithms?
- Enable discrimination
  - Reveal race and sexual orientation which could be used for automated discrimination, e.g. credit application
  - Solution? Have a review authority for appeals?

Privacy Problems with BDA

- Few (if any) protection under the law
  - Organizations only comply (if at all) with existing legal requirements for personal data protection
  - No laws governing private information revealed with BDA
  - Solution? Enact privacy laws for BDA?
- Big data may never go away
  - Organizations never destroy data, only accumulate more and more data
  - Private information may never be destroyed
  - Solution? Legal framework to force data destruction?

References

- Rebecca Herold, “10 Big Data Analytics Privacy Problems”, accessed Sept. 7, 2016 at: https://www.secureworldexpo.com/10-big-data-analytics-privacy-problems
- Epic.org, “Big Data and the Future of Privacy”, accessed Oct. 3, 2016 at: https://epic.org/privacy/big-data/
- PCAST, “Big Data and Privacy: A Technological Perspective”, accessed Oct. 3, 2016 (URL too long to include here – search for it).

Bio of George Yee:

George Yee is a research scientist with his own company Aptusinnova Inc., which conducts research in Information Security and Privacy. Previously he was an IT Research Analyst with the Office of the Privacy Commissioner of Canada, and a Senior Research Officer in the Information Security Group of the National Research Council Canada (NRC). Prior to joining the NRC, he spent over 20 years working in telecommunications at Bell-Northern Research and Nortel Networks. George received his Ph.D. (Electrical Engineering) from Carleton University, Ottawa, Canada, where he is an Adjunct Research Professor. He is a Senior Member of IEEE, and member of ACM and Professional Engineers Ontario. His current research interests include security and privacy for the Internet of Things and Cloud Computing.

SIMSPACE CORPORATION

Topic: Focus on Cyber-Data: Dealing with Data Complexity?

Panelist: **Dr. Thomas J. Klemas**

Cybersecurity through
PEOPLE, PROCESS & TECHNOLOGY

SimSpace

BOSTON (HQ)
320 Congress St.
Boston, MA 02210
www.simspace.com

Focus on Cyber-Data: Dealing with Data Complexity?

Principal discussion topics

- Instrumentation Big Data catch-22
- Users are limiting factor
- Cyber Risk Management: Incentive to report is weak

Instrumentation Big Data catch-22

- Volume and velocity typically force Trade-offs
- Adversaries are well aware of tool limitations, trade-offs, & resulting decisions
- Alert overload
  - Fine tuning of tools can be an art
  - Adversaries can take advantage of fine tuning issues to hide in the "noise"

Biggest Security Risk

- Users (reinforced by recent Chertoff article)
  - Centrally managed security policy enforcement can help
  - Too much managed security can severely restrict flexibility and productivity
- Adversaries are handling cyber complexity all too well
  - Already have a huge advantage
    - Defenders have to protect everything
    - Attackers only need to find 1 weak link
  - Human nature aids adversary significantly
    - Security is always second fiddle to productivity
  - Offense decide time of encounter, not defense.
    - Time on attacker's side
    - Thus, brute force approaches are very amenable for offense

Cyber Risk Management: Incentive to report is weak

- Lack of understanding
  - True incident rate
  - True impact
- Data shortcomings severely complicates
  - Insurance
  - Making meaningful decisions
- It would be a Big Data problem but data accessibility is key issue!

Dejan Zupan

The Analysis of Temperature Measurements in Massive Concrete

Panel on ATA ANALYTICS - CYBER

NexTech 2016

Venice, Italy

October 9 – 13, 2016

*University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia

Measurements

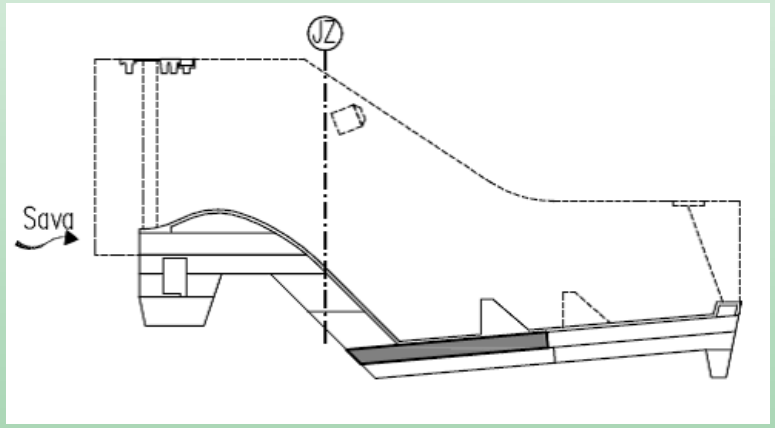
- High-resolution fiber optic system.

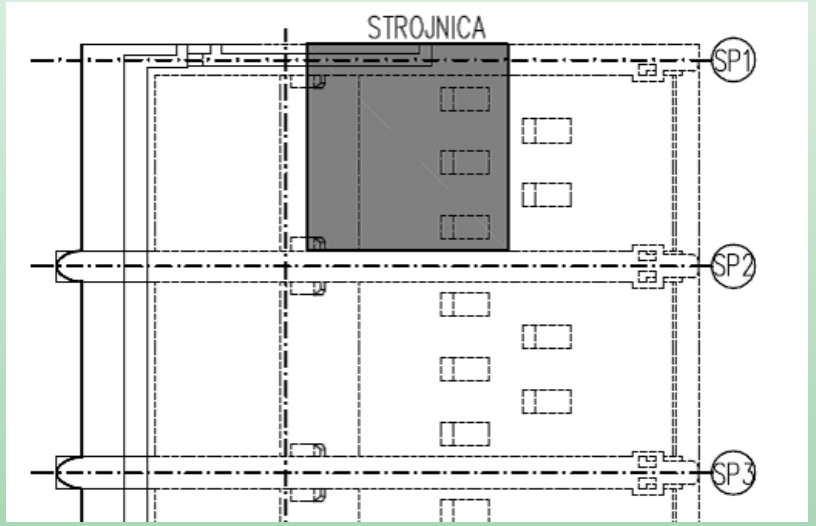
Measurements

- High-resolution fiber optic system.
- Concrete block of a size of $17.7 \times 17 \times 1.5$ m.

Measurements

- High-resolution fiber optic system.
- Concrete block of a size of 17.7×17×1.5 m.
- A part of the stilling basin base plate:





Installation

- Seven loops in 3 height levels.

Installation

- Seven loops in 3 height levels.
- Effective length is 798 m with 2 793 measuring points.

Installation

- Seven loops in 3 height levels.
- Effective length is 798 m with 2 793 measuring points.
- 15-minute time step.

Calibration of measuring points

- Relative distance between measuring points is 25 cm.

Calibration of measuring points

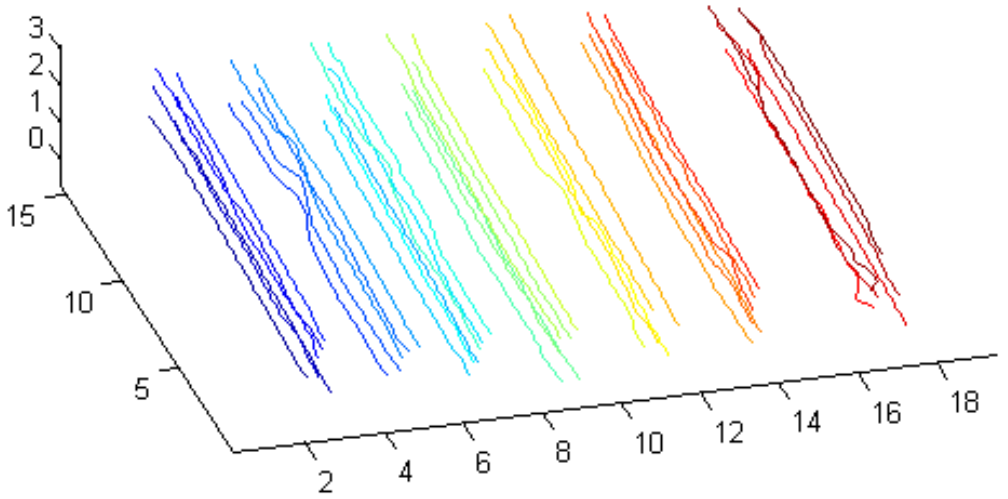
- Relative distance between measuring points is 25 cm.
- Determine their coordinates in local coordinate system.

Calibration of measuring points

- Relative distance between measuring points is 25 cm.
- Determine their coordinates in local coordinate system.
- Positions in global coordinate system obtained by 3D laser scanner.

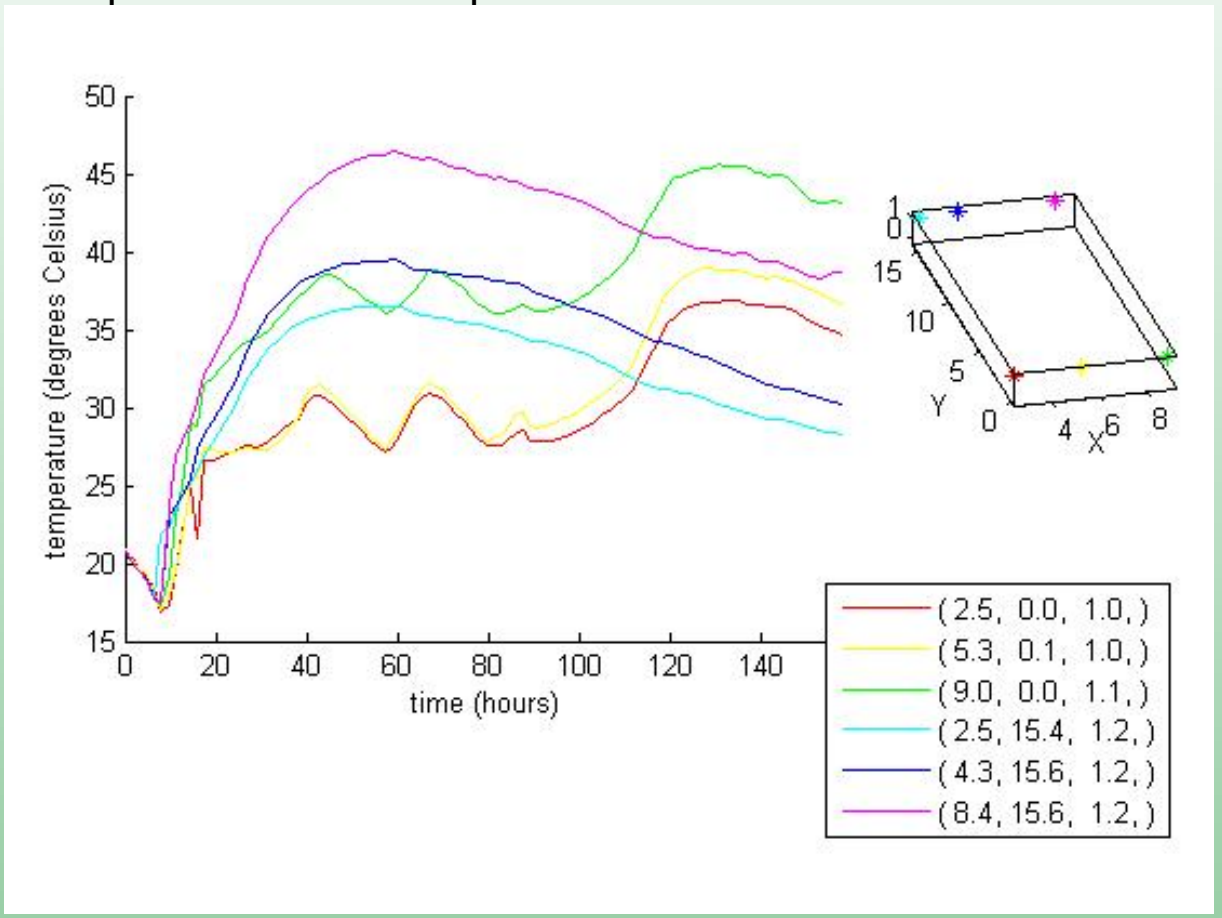
Calibration of measuring points

- Relative distance between measuring points is 25 cm.
- Determine their coordinates in local coordinate system.
- Positions in global coordinate system obtained by 3D laser scanner.
- Linear regression was used.



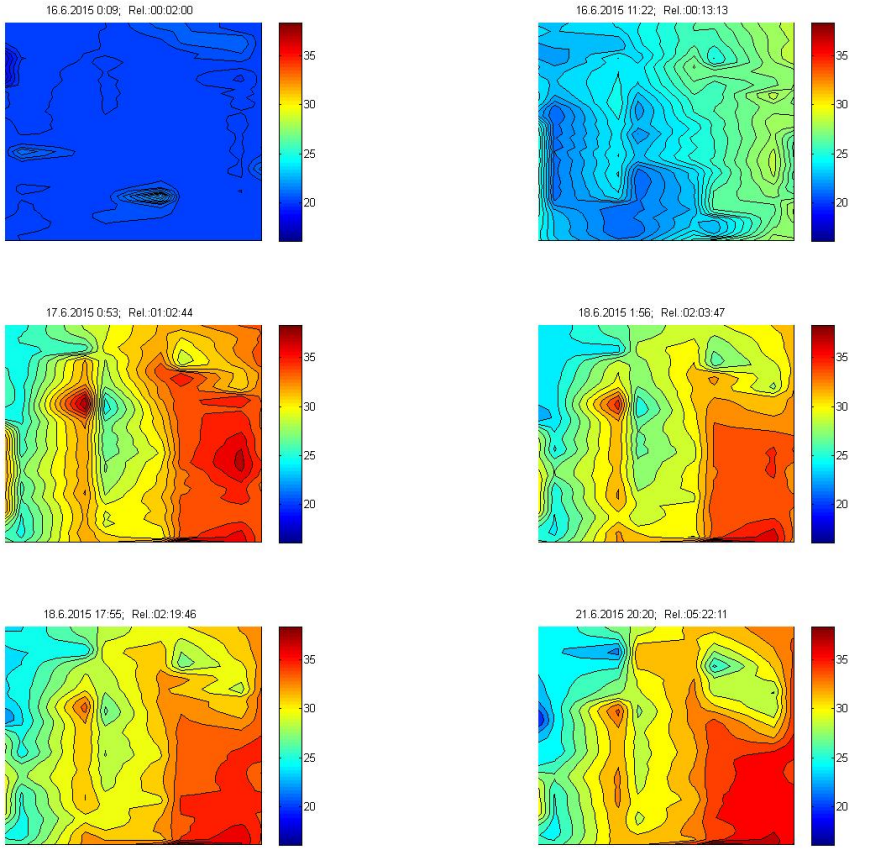
Analysis of measured data

- Time response at discrete points.



Analysis of measured data

- Temperature fields in planar regions inside block.



Challenges

- Further calibration of measuring points.

Challenges

- Further calibration of measuring points.
- Efficient monitoring on site.

Challenges

- Further calibration of measuring points.
- Efficient monitoring on site.
- 3D numerical model with low number of parameters.

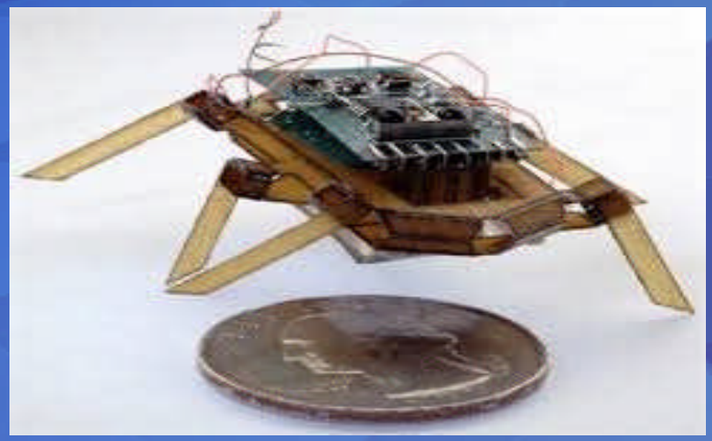
Challenges

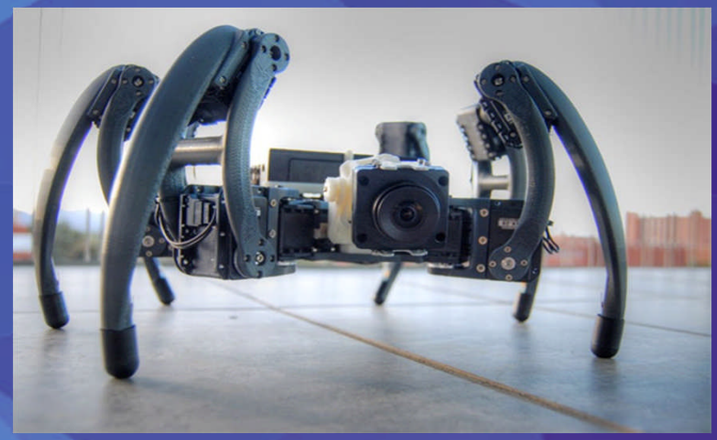
- Further calibration of measuring points.
- Efficient monitoring on site.
- 3D numerical model with low number of parameters.
- Stohastic approach.

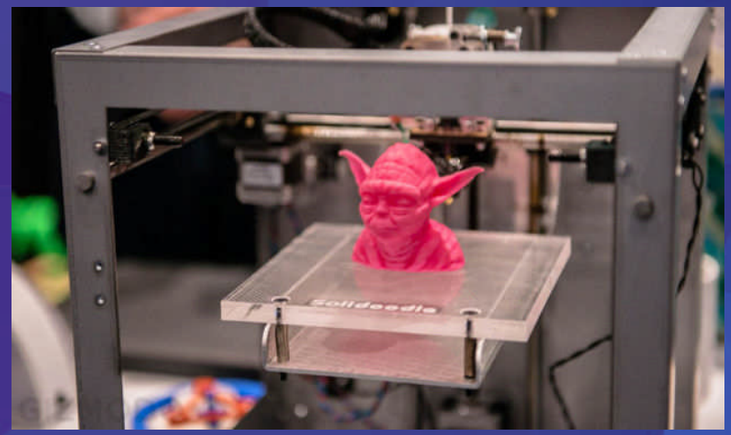
Challenges

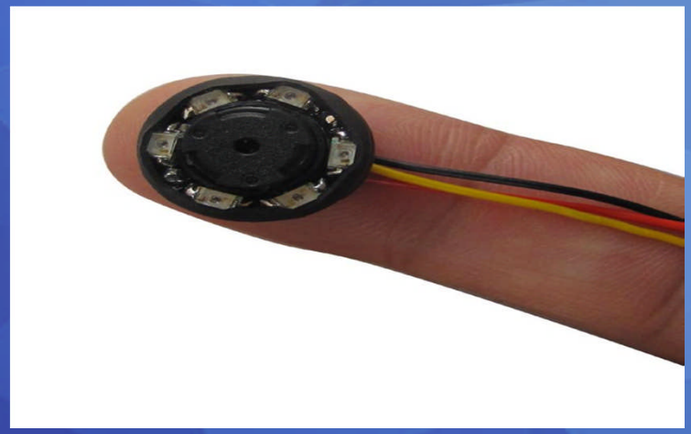
- Further calibration of measuring points.
- Efficient monitoring on site.
- 3D numerical model with low number of parameters.
- Stohastic approach.

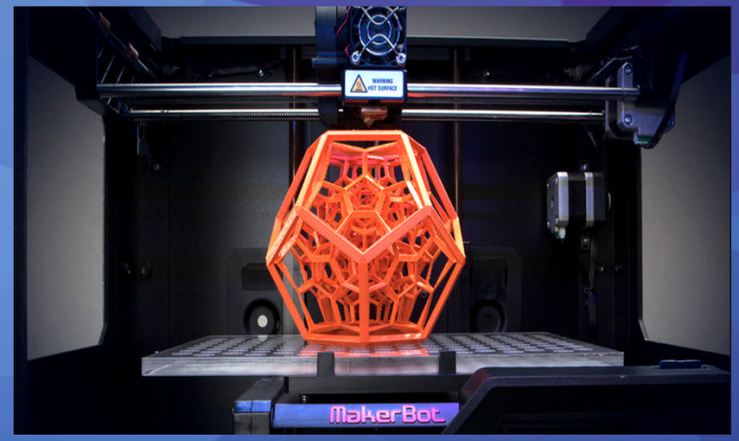

Pluribus Technologies

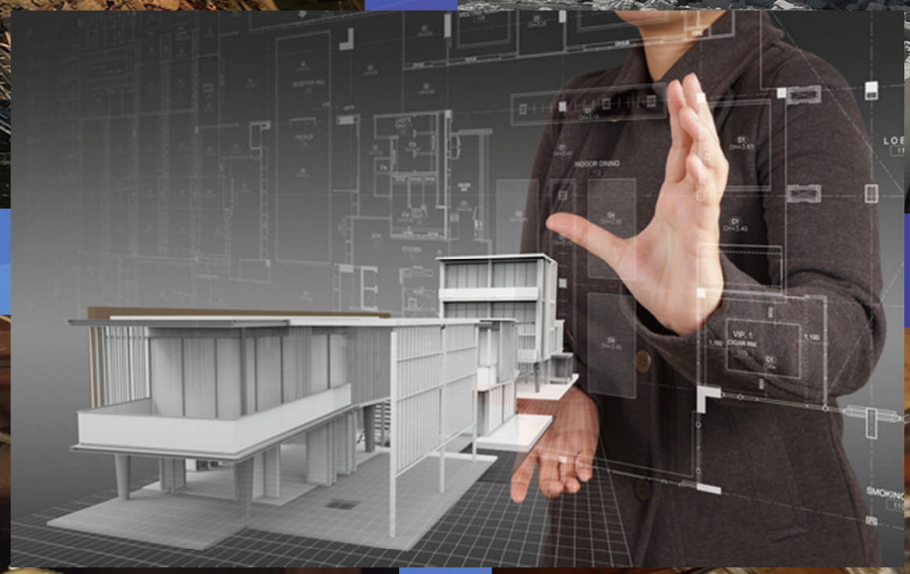




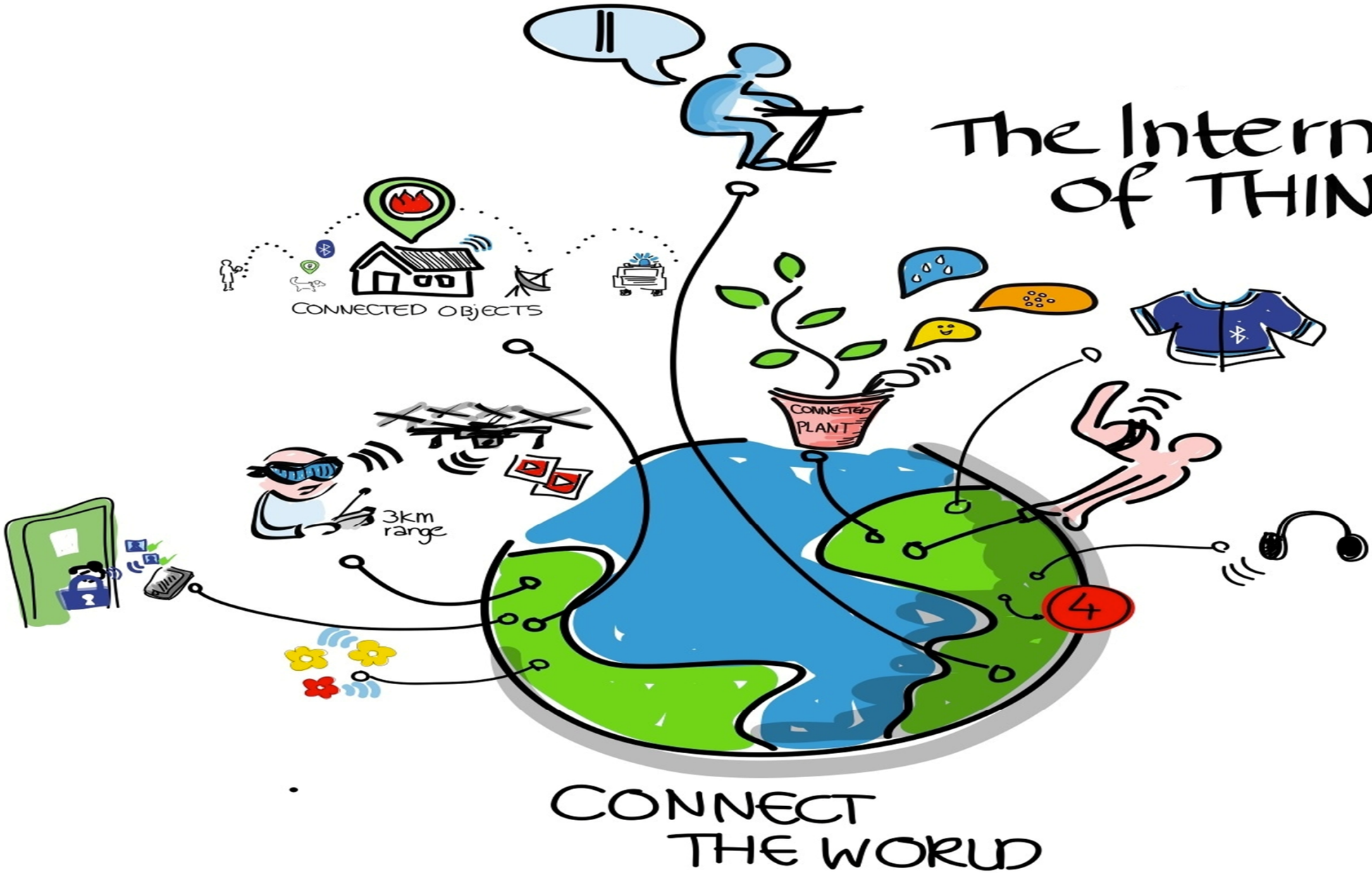

Solidoodle



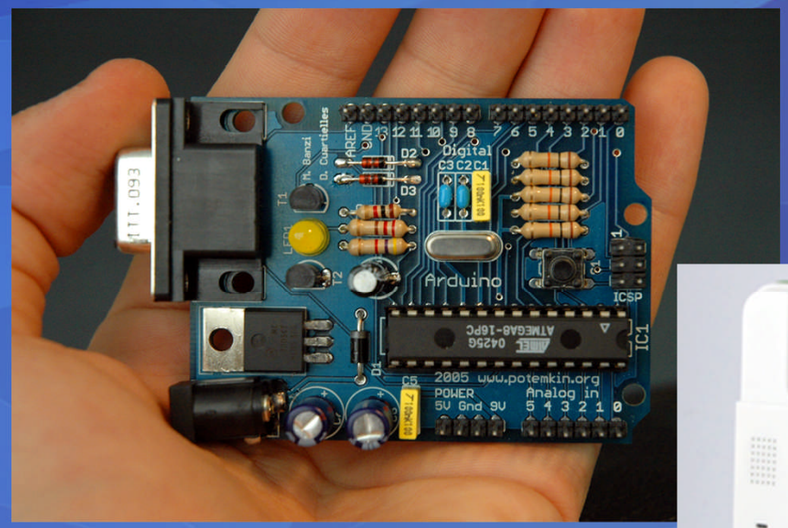

MakerBot



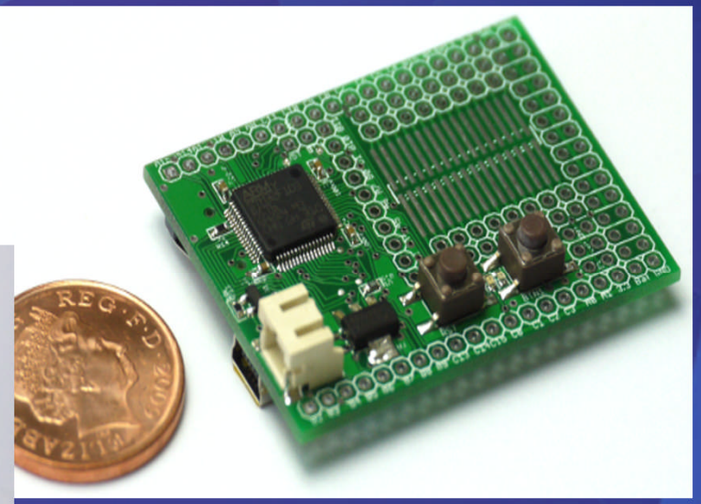

10/19/2012

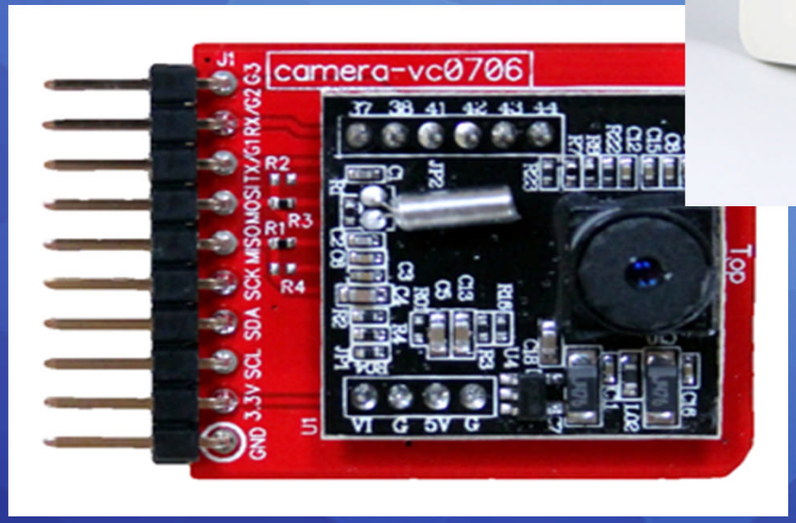

The Internet of THINGS
CONNECTED OBJECTS
CONNECTED PLANT
3km range
4
CONNECT THE WORLD

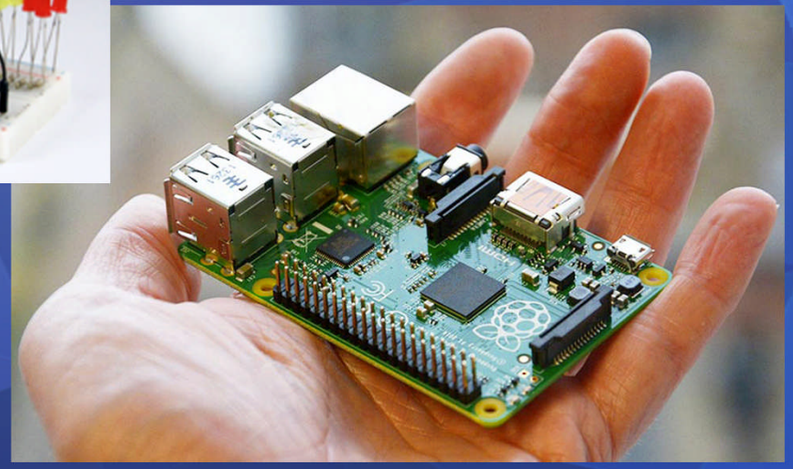
The Maker Movement

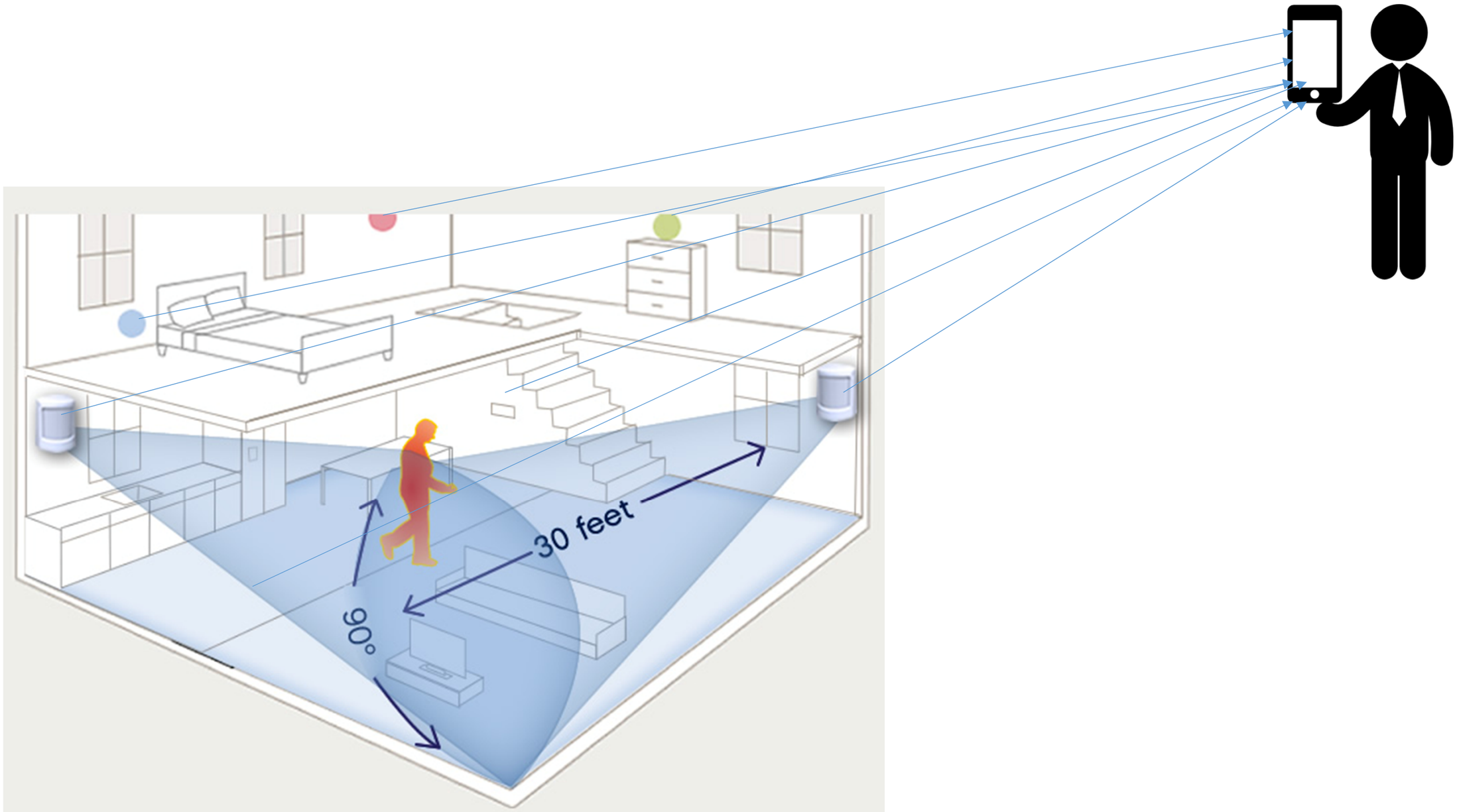

Arduino
2005 www.potemkin.org
POWER
Analog in

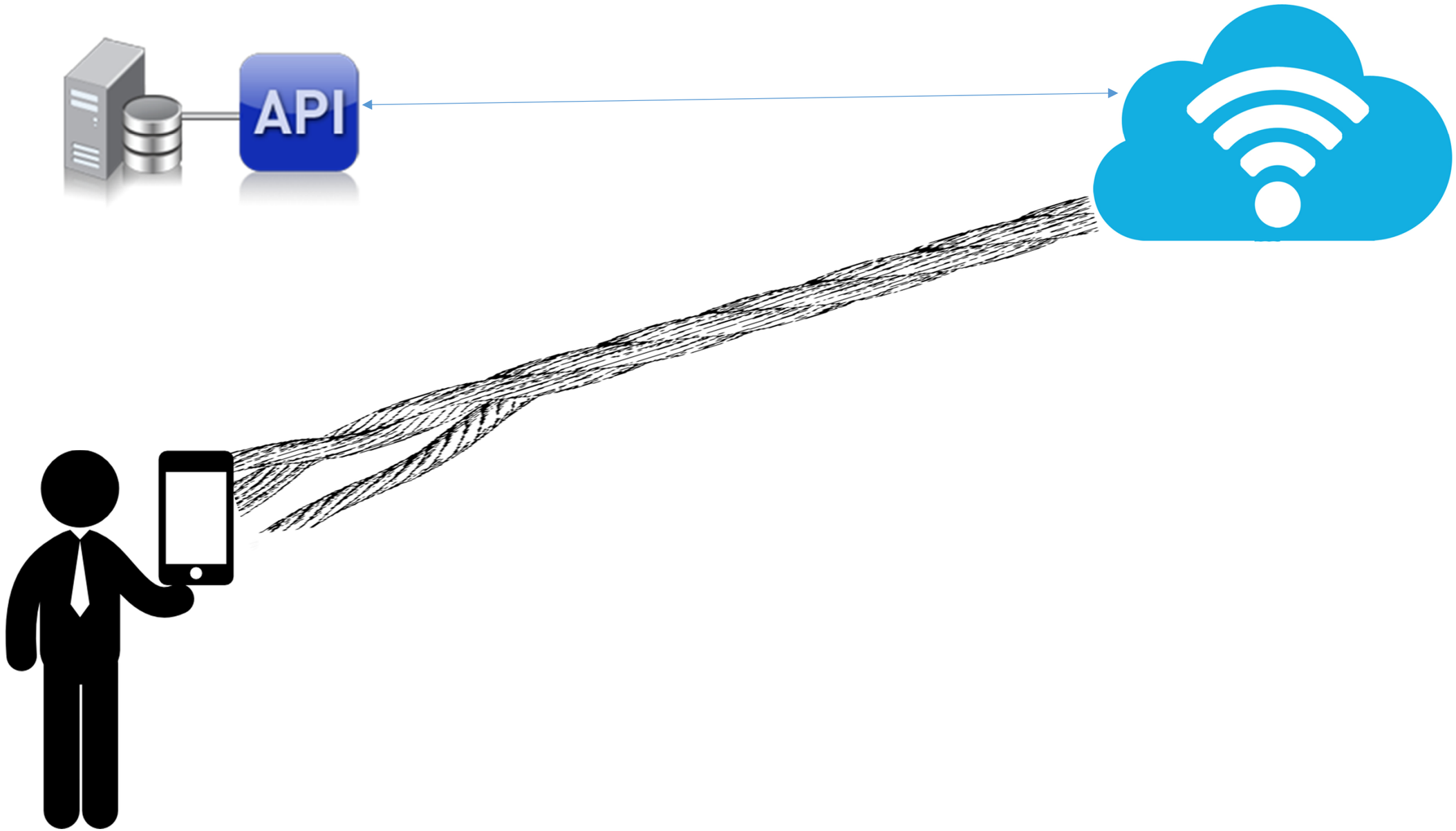

Kinoma




camera-vc0706
GND 3.3V SCL SDA SCK MSO MOSI TX/G1 RX/G2 G3
VI C 5V G
Top




30 feet
90°


API

Questions – Bringing Light to your Darkness!