Internet of Things (IoT): Patents

Legal and Factual Challenges

Brussels, 16 March 2016

Patent Attorney Dipl.-Ing. Andreas Thielmann
Introduction

Computer Implemented Inventions

Granted Patents / Patents as a Source for Information

'Big Data'

Future Challenges

Summary
## Internet of Things - Virtuality meets Reality

<table>
<thead>
<tr>
<th>Internet</th>
<th>Things</th>
</tr>
</thead>
<tbody>
<tr>
<td>- „internet structure“</td>
<td>- (physical) objects</td>
</tr>
<tr>
<td>- network connectivity</td>
<td>- devices</td>
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<tr>
<td>- communication systems</td>
<td>- vehicles</td>
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<tr>
<td>- cyber-physical systems</td>
<td>- wearables</td>
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<tr>
<td>- …</td>
<td>- buildings</td>
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<td></td>
<td>- …</td>
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<td></td>
<td>- business methods?</td>
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<td>- traffic control?</td>
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<td>- energy management?</td>
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<td>- transportation/logistics?</td>
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<td>- …</td>
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</table>
IoT - How does it work?

**HARDWARE**
Electronics (sensors, actuators, transponders etc.)

**SOFTWARE**
Programs (network connectivity, infrastructure etc.)

„BIG DATA“
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Summary
EPO: What is an invention?

Art. 52 (1) EPC

European patents shall be granted for

any inventions, in all fields of technology,

provided that they

- are new,

- involve an inventive step and

- are susceptible of industrial application.
EPO: What is excluded from patentability?

Art. 52 (2) EPC

The following in particular shall not be regard as inventions:

a) discoveries, scientific theories and mathematical methods;
b) aesthetic creations;
c) schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers;
d) presentations of information.

Art. 52 (3) EPC

(…) only to the extent to which a European patent application or European patent relates to such subject-matter or activities as such.
EPO: What is excluded from patentability? (cont‘d)

In „normal“ words:

No patent protection if the subject-matter of the claim

– defines merely a business or administrative method and

– does not have a technical character.
Computer Implemented Inventions (CII)

Effects of Industry 4.0
- Digitisation of Manufacturing/Logistics, M2M-Communication
- Aim of a „Smart Factory“, 
- Industry 4.0 uses different concepts such as
  - Cyber-physical systems (CPS)
  - Internet of Things (IoT)
  - Big Data

First Steps on the way to Digitisation¹:
- Giving particular names or IDs to all products and resources
- Sensing, detecting, measuring,…to get all data
- Linking of all digitised information for analysis

¹ Source: Strategie & Industrie 4.0, Chance und Herausforderungen der vierten Industriellen Revolution, S. 46
Computer Implemented Inventions (CIIs) (cont’d)

• Industry 4.0 leads (due to the usage of IoT/CPS) to a growing importance of **Software**, e.g.
  – in the field of sensor technology
  – in the field of machine controlling
  – in data evaluation
• CPS provide the link between mechanical and electronical components with information and software related components
• But: Innovations are found more often in the area of software related components

*Is this a problem - since „Software“ is not patentable?*
Computer Implemented Inventions (CII) (cont‘d)

Prescription smart label bottle
- Computer readable prescription
- Reminding of the Patient
- Monitoring its content
- ...

Claim 15:
A prescription smart label mobile application system comprising:
- at least one group of digital codes to receive and transmit data using a digital device;
- at least one group of digital codes to capture, record and determine the content of photographic images; and
- at least one group of digital codes to convert images into digital text.
Computer Implemented Inventions (CII) (cont’d)

Objection during the (U.S.) examination procedure

“Claims 15 - 20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The four statutory categories of invention include a process, machine, manufacture or composition of matter. Claims 15 - 20 recite a mobile application system comprised of "codes" and "features" for performing certain functions. The claims are drawn to a system of software codes, per se, which does not fall into one of the four statutory categories of invention.”

An example of a patentable claim

A prescription smart label bottle and cap for aiding and tracking a patient's use of prescription medication comprising:

a recyclable and flexible prescription smart label including:

[...]
Because Alice Corporation’s patent claims involving (1) a method for exchanging financial obligations, (2) a computer system as a third-party intermediary, and (3) a computer-readable medium containing program code for performing the method of exchanging obligations are drawn to a patent-ineligible abstract idea under 35 U.S.C. § 101, they are not patent eligible under Section 101.

⇒ computer implemented methods are still patent eligible in case „significantly more“ is claimed

Problem:
e-commerce applications („biz methods“)
UPDATE ON SECTION 101 REJECTIONS AT THE USPTO

By: Robert R. Sachs

In my June post, The One Year Anniversary: The Aftermath of AliceStorm, I surveyed the frequency of Section 101 rejections at the USPTO. My analysis was based on approximately 300,000 office action and notices of allowance received from Patent Advisor.

As a reminder, the Section 101 rejection rates from the June post at the level of the USPTO Technology Center (TC) are shown below. The numbers here are the percentage of all events in the cohort (TC and time period) that had a Section 101 rejection. An event is either an allowance or a rejection; other events such as restriction requirements, advisory actions, and so forth are not counted.

Since June, I’ve received a significant amount of new data from Patent Advisor. The trends we saw before are continuing, with some interesting new developments.

“In re Bilski” (CAFC 2008)

Source: http://www.bilskiblog.com/
Granted Patents (I)

(12) United States Patent
Kapoor et al.

(54) ATTRIBUTE-BASED IDENTIFICATION SCHEMES FOR OBJECTS IN INTERNET OF THINGS

(75) Inventors: Shalini Kapoor, Bangalore (IN); Shachi Sharma, Delhi (IN); Bharat Ramakrishnan Srinivasan, Atlanta, GA (US)

(73) Assignee: International Business Machines Corporation, Armonk, NY (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 13/359,900

(22) Filed: Jan. 27, 2012

(51) Int. Cl.
G06F 17/30 (2006.01)

(52) U.S. Cl.
USPC ...................................................... 707/754

(58) Field of Classification Search
USPC ...................................................... 707/754
See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS
8,004,407 B2 8/2011 Troper

(10) Patent No.: US 8,495,072 B1
(45) Date of Patent: Jul. 23, 2013

FOREIGN PATENT DOCUMENTS

OTHER PUBLICATIONS


* cited by examiner

Primary Examiner — Baoquye N To
(74) Attorney, Agent, or Firm — Ference & Associates LLC

(57) ABSTRACT

Methods and arrangements for object identification. An identification request is received from different objects of a network. Attributes and values of each object are ascertained, and at least one attribute-value pair from each object is filtered out. An ID is generated for each object based on at least one remaining attribute-value pair from the filtering.

21 Claims, 7 Drawing Sheets
What is claimed is:
1. A method comprising:
Receiving an identifying request from different objects of a network;
Ascertaining attributes and values of each object;
Filtering out at least one attribute-value pair from each object; and
Generating ID for each object based on at least one remaining attribute-value pair from said filtering;
Wherein said filtering comprises ascertaining attribute entropy and attribute requirements; and
Wherein said filtering further comprises accepting attribute-value pairs with attribute entropy between pre-determined upper and lower entropy bounds.
US 8,495,072 B1

START

RECEIVE ID REQUEST FROM DIFFERENT OBJECTS

602

604

ASCERTAIN ATTRIBUTES AND VALUES OF EACH OBJECT

FILTER OUT AT LEAST ONE ATTRIBUTE-VALUE PAIR FROM EACH OBJECT

606

608

FINISH

GENERATE ID FOR EACH OBJECT
Granted Patents (II)

(12) United States Patent
Kuffner, Jr. et al.

(54) SYSTEMS AND METHODS FOR
ALLOCATING TASKS TO A PLURALITY OF
ROBOTIC DEVICES

(71) Applicant: Google Inc., Mountain View, CA (US)

(72) Inventors: James J. Kuffner, Jr., Mountain View,
CA (US); Ryan Hickman, Mountain
View, CA (US)

(73) Assignee: Google Inc., Mountain View, CA (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 154 days.

(21) Appl. No.: 13/757,810
(22) Filed: Feb. 3, 2013

Related U.S. Application Data

(60) Provisional application No. 61/595,872, filed on Feb.
7, 2012.

(51) Int. Cl.
B25J 9/16 (2006.01)
B25J 9/00 (2006.01)

(52) U.S. Cl.
CPC ................ B25J 9/0084 (2013.01); Y10S 901/01
(2013.01); G05B 2219/40095 (2013.01); G05B 2219/39117 (2013.01)

Field of Classification Search
CPC ...... B25J 9/1656; B25J 9/1671; B25J 9/0084;
G05B 2219/39117; G05B 2219/40095; G05D 1/0291;
G05D 1/0297
USPC ....................................................... 700/248
See application file for complete search history.

(56) References Cited
U.S. PATENT DOCUMENTS

6,374,155 B1 * 4/2002 Wallach et al. ........... 700/245

(10) Patent No.: US 9,008,839 B1
(45) Date of Patent: Apr. 14, 2015

7,600,593 B2 10/2009 Filippov et al.
8,366,078 B1 * 2/2013 Hickman et al. ........... 700/245
8,428,777 B1 * 4/2013 Poursadeghi et al. .... 700/248

(Continued)

OTHER PUBLICATIONS

Parker, Lynn, "Lifelong adaptation in heterogeneous multi-robot
tools—response to continual variation in individual robot

(Continued)

Primary Examiner — Behrang Badii
Assistant Examiner — David Testardi
(74) Attorney, Agent, or Firm — McDonnell Boehnen
Hulbert & Berghoff LLP

(57) ABSTRACT

Methods and systems for allocating tasks to robotic devices are provided. An example method includes receiving information associated with task logs for a plurality of robotic devices and in a computing system configured to access a processor and memory, determining information associated with a health level for the plurality of robotic devices based on the information associated with the task logs. A health level for a given robotic device may be proportional to a current level of ability to perform a function, which may change over a lifespan of the given robotic device. Information associated with a plurality of tasks to be performed by one or more of the robotic devices may also be determined. According to the method, the computing system may optimize an allocation of the plurality of tasks such that a high precision task may be allocated to a robotic device having a greater current health level than another robotic device.

20 Claims, 7 Drawing Sheets
What is claimed is:
1. A method comprising:
   receiving task log information for a plurality of robotic devices, wherein a selected task log for a robotic device comprises task information for tasks performed by the robotic device, including a number of times the robotic device performed a task;
   in a computing system configured to access a processor and a memory, determining a health level for each of the plurality of robotic devices based on the task log information, wherein the health level for the robotic device comprises an estimate of an expected remaining amount of time until maintenance of the robotic device;
   determining, for a plurality of tasks to be performed by one or more of the plurality of robotic devices, a first amount of positioning precision for a first task and a second amount of positioning precision for a second task, wherein the first amount of positioning precision is more precise than the second amount of positioning precision; and
   the computing system allocating the plurality of tasks to one or more robotic devices of the plurality of robotic devices based on the respective health levels for the plurality of robotic devices and the respective positioning precision of the plurality of tasks, such that the first task having the more precise first amount of positioning precision is allocated to a first robotic device having a first health level that is greater than a second health level of a second robotic device; and
   the computing system communicating the allocated plurality of tasks to the one or more robotic devices of the plurality of robotic devices.
US 9,008,839 B1

FIGURE 1
**United States Patent**
Zhang

**METHOD, DEVICE AND SYSTEM FOR MONITORING INTERNET-OF-THINGS DEVICE REMOTELY**

(54) Inventor: Fei Zhang, Shenzhen (CN)

(73) Assignee: ZTE Corporation, Shenzhen, Guangdong (CN)

(12) Foreign Application Priority Data
US 2014/0330959 A1 Nov. 6, 2014

(30) Foreign Application Priority Data
Jul. 18, 2011 (CN) 2011 1 0200814

(51) Int. Cl.
G06F 15/173 (2006.01)
G06F 15/177 (2006.01)

(52) U.S. Cl.
CPC " ........ H04L 43/045 (2013.01); H04L 12/2803 (2013.01); H04L 67/025 (2013.01); H04L 67/125 (2013.01)

(58) Field of Classification Search
CPC ........ H04L 67/025; H04L 67/125; H04L 12/2803
USPC .......................... 709/221-224

See application file for complete search history.

**References Cited**

U.S. PATENT DOCUMENTS
2011/0265150 A1 10/2011 Cha
2012/0302254 A1 11/2012 Chargui et al. 455/456.1

FOREIGN PATENT DOCUMENTS
CN 101888399 A 11/2010
CN 201750439 U 2/2011

OTHER PUBLICATIONS
Boussard, Mathieu et al., Navigating the Web of Things: Visualizing and Interacting with Web-Enabled Objects, Oct 18, 2010

Primary Examiner — Minh-Chau Nguyen
Attorney, Agent, or Firm — Oppenheimer Patent Law Firm LLC

**Abstract**
The disclosure discloses a method for monitoring an Internet-of-things device remotely. The method includes that: a User Equipment (UE) acquires an Internet Protocol (IP) address of a required Internet-of-things device from remote router, and acquires device detail information of the Internet-of-things device that is consistent with the acquired IP address. It further receives a virtual control panel of the Internet-of-things device according to the acquired device detail information, and maps keys of the virtual control panel to the control logic of the keys of the virtual control panel, and further monitors the Internet-of-things device remotely by operating the virtual control panel. The disclosure further discloses a device and system for monitoring an Internet-of-things device remotely. With the disclosure, it is possible to implement visualization, remote, and smart monitoring of an Internet-of-things device, so that operation by a user at a UE is as simple, clear, and easy as operation of a real Internet-of-things device, thereby reducing difficult in operation greatly.

17 Claims, 2 Drawing Sheets
US 9,191,289 B2

The invention claimed is:
1. A method for monitoring an Internet-of-things device remotely, comprising:
   acquiring, by a User Equipment (UE), an Internet Protocol (IP) address of an Internet-of-things device from a remote router, and acquiring, by the UE, device-detail information of the Internet-of-things device corresponding to the IP address according to the acquired IP address;
   drawing, by the UE, a virtual control panel of the Internet-of-things device according to the acquired device-detail information, and mapping, by the UE, keys of the virtual control panel and a control logic of the keys of the virtual control panel; and
   monitoring, by the UE, the Internet-of-things device remotely by operating the virtual control panel.
US 9,191,289 B2
A UE acquires an IP address of a required Internet-of-things device from a remote router

The UE acquires device-detail information of the Internet-of-things device according to the acquired IP address

The UE draws a virtual control panel of the Internet-of-things device according to the acquired device-detail information

The UE monitors the Internet-of-things device remotely through the drawn virtual control panel
Patent Documents as a source for information

<table>
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<th>Metric</th>
<th>Value</th>
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<tr>
<td>Number of patent families</td>
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*Source: Eight Great Technologies, The Internet of Things - A patent overview, The Intellectual Property Office (UK), 2014*
## IPC Classes for IoT Patents

<table>
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<tr>
<th>Class</th>
<th>Description</th>
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<tbody>
<tr>
<td>H04L29/08</td>
<td>Communication control; Communication processing -&gt; characterised by a protocol -&gt; Transmission control procedure, e.g. data link level control procedure</td>
</tr>
<tr>
<td>H04L12/28</td>
<td>Data switching networks -&gt; characterised by path configuration, e.g. LAN (Local Area Networks) or WAN (Wide Area Networks)</td>
</tr>
<tr>
<td>H04L29/06</td>
<td>Communication control; Communication processing -&gt; characterised by a protocol</td>
</tr>
<tr>
<td>G06F15/16</td>
<td>Digital computers in general; Data processing equipment in general -&gt; Combinations of two or more digital computers each having at least an arithmetic unit, a programme unit and a register, e.g. for a simultaneous processing of several programmes</td>
</tr>
<tr>
<td>G05B19/418</td>
<td>Programme-control systems -&gt; electric -&gt; Total factory control, i.e. centrally controlling a plurality of machines, e.g. direct or distributed numerical control (DNC), flexible manufacturing systems (FMS), integrated manufacturing systems (IMS), computer integrated manufacturing (CIM)</td>
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<tr>
<td>H04W84/18</td>
<td>Network topologies -&gt; Self-organising networks, e.g. ad hoc networks or sensor networks</td>
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<tr>
<td>H04W4/00</td>
<td>Services or facilities specially adapted for wireless communication networks</td>
</tr>
<tr>
<td>G08C17/02</td>
<td>Arrangements for transmitting signals characterised by the use of a wireless electrical link -&gt; using a radio link</td>
</tr>
<tr>
<td>H04W72/04</td>
<td>Local resource management, e.g. selection or allocation of wireless resources or wireless traffic scheduling -&gt; Wireless resource allocation</td>
</tr>
<tr>
<td>H04B7/26</td>
<td>Radio transmission systems, i.e. using radiation field -&gt; for communication between two or more posts -&gt; at least one of which is mobile</td>
</tr>
</tbody>
</table>

*Source: Eight Great Technologies, The Internet of Things - A patent overview, The Intellectual Property Office (UK), 2014*
Year-on-year comparison of IoT related and 'all technologies' patents

Applications per IPC Classes

<table>
<thead>
<tr>
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<td>H04B7/25</td>
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</table>

Applicants of IoT Patent Applications

Specific Information

Publications in IPC Class G 05 B 19/418

→ PHYSICS

→ CONTROLLING; REGULATING
  → Programme-control systems

G 05 B 19/418: Total factory control, i.e. centrally controlling a plurality of machines, e.g. direct or distributed numerical control [DNC], flexible manufacturing systems [FMS], integrated manufacturing systems [IMS], computer integrated manufacturing [CIM]
Introduction – Patents as Source for Information (cont’d)

Patent Applications regarding „Industry 4.0“ January 2013 to April 2015

“From your point of view, which country is most advanced in Industry 4.0? (average rating, 8 = most advanced)”  

3 Source: Fraunhofer IAO, Chinese Industry 4.0 Patents, Volume 01 (Electronic Publication), China’s High-Impact Patents of Industry 4.0 from January 2013 to April 2015

4 Source: China, Industrie 4.0 Index 2015, Eine Studie der Staufen AG
Who will be the owner of the data?

![Diagram showing the flow of data from Sub-Supplier to Supplier to Manufacturer to Customer, with Big Data and Service provider (Analysis) in the middle.]
Ownership of Data

Communication from the EU Commission „A Digital Single Market Strategy for Europe“ ⁵:

4.1 (...) The Commission will propose in 2016 a European ‘Free flow of data’ initiative that tackles restrictions on the free movement of data for reasons other than the protection of personal data within the EU and unjustified restrictions on the location of data for storage or processing purposes. It will address the emerging issues of ownership, interoperability, usability and access to data in situations such as business-to-business, business to consumer, machine generated and machine-to-machine data. It will encourage access to public data to help drive innovation. The Commission will launch a European Cloud initiative including cloud services certification, contracts, switching of cloud services providers and a research open science cloud.

⁵ Source: COM(2015) 192 final
Ownership of Data (cont’d)

Commission Staff Working Document ⁶:

The collection, storage and processing of data are central to the development and adoption of these digital services. The increase in volumes of data is exponential – 90% of data circulating worldwide did not exist two years ago. It is expected that by 2020 more than 16 zettabytes of useful data will exist, which implies an equivalent growth of 236% per year from 2013 to 2020. **Data has become a new factor of production, an asset and in some transactions a new currency.**

Communication from the EU Commission „A Digital Single Market Strategy for Europe“ ⁵:

The digitisation of all industrial sectors will be key to keeping a strong European industrial base and will enable Europe to manage **the transition to a smart industrial system (Industry 4.0).**

⁵ Source: COM(2015) 192 final
⁶ Source: SWD(2015) 100 final
(...for those who don’t know...)

Zettabyte

From Wikipedia, the free encyclopedia

The zettabyte is a multiple of the unit byte for digital information. The prefix zetta indicates multiplication by the seventh power of 1000 or 10^21 in the International System of Units (SI). A zettabyte is one sextillion (one long scale trillion) bytes. The unit symbol is ZB.

1 ZB = 1000^7 bytes = 10^21 bytes = 1,000,000,000,000,000,000,000 bytes
1000 exabytes = 1 million petabytes = 1 billion terabytes = 1 trillion gigabytes.

A related unit, the zebibyte (ZiB), using a binary prefix, is equal to 1024^7 bytes.

Usage examples [ edit ]

- GUID Partition Table (GPT) allows for a maximum disk and partition size of 7.02 zettabytes, or 5.946 zebibytes, when using 512-byte sectors.[6][7]
- ZFS allows for a maximum storage capacity of 256 quadrillion zettabytes.[8]
Introduction

Computer Implemented Inventions

Granted Patents / Patents as a Source for Information

‘Big Data‘

Future Challenges

Summary
Future Challenges

Legal challenges:
- Requirements for patentability might change
- Rules for data treatment and ownership
- …

Factual challenges:
- Data safety – protection against fraud
- Protection against ‘cyber attacks’
- …
Big Data

“Companies capitalize on industrial IoT data analysis“

„Data Mining“

„Another Industry Patent War?“ (First examples ⁷)

⁷ Source: Kenie Ho: Internet of Things: Another Industry Patent War?, Landslide (ABA), November/December 2015
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</table>
Thank you for your attention!
Thank you for your attention!

Source: Video: http://ec.europa.eu/priorities/digital-single-market_en
Sources:

1. Strategy&: Industrie 4.0, Chance und Herausforderungen der vierten Industriellen Revolution, S. 46


3. Fraunhofer IAO, Chinese Industry 4.0 Patents, Volume 01 (Electronic Publication), China’s High-Impact Patents of Industry 4.0 from January 2013 to April 2015

4. China, Industrie 4.0 Index 2015, Eine Studie der Staufen AG


