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서 울 대 학 교
SEOUL NATIONAL UNIVERSITY

Patent Acquisition Opportunity

Strictly confidential
April 2015

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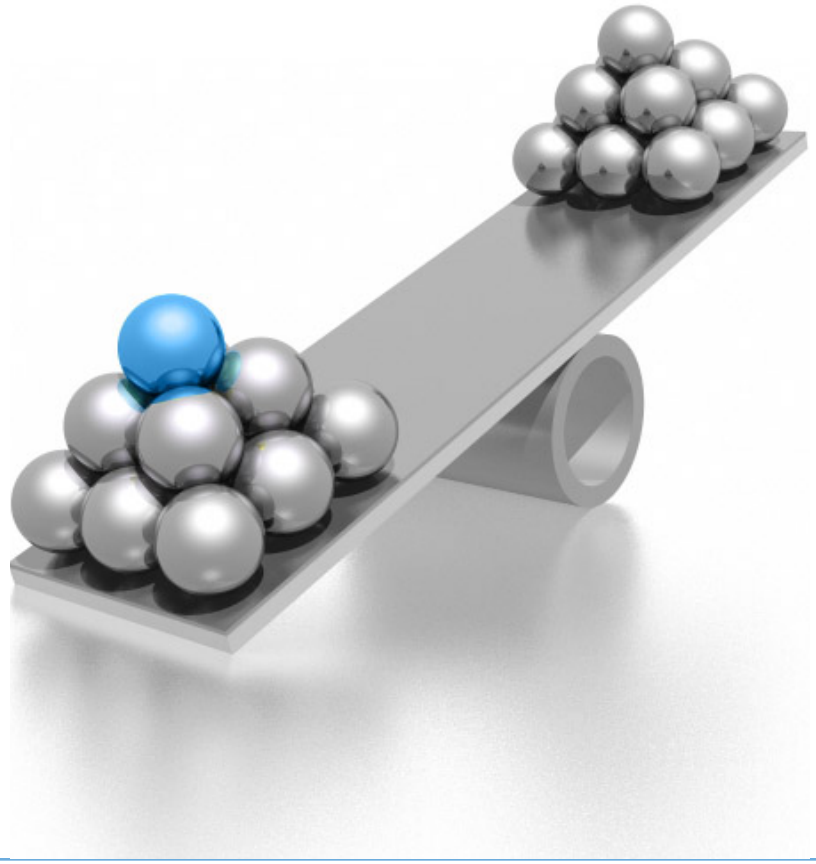
Table of contents



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Executive summary

Portfolio overview

- The patent offering from Seoul National University comprises 31 US patents across 31 families, including foreign filings in China, Japan and Germany
- There are 5 key patents in this portfolio
- The portfolio includes patents relating to wireless communications, sensing, IP networking technologies and 3D CAD systems
- The priority date for this patent is 18th December 2000.

Encumbrances

- No licenses
- No buyer restrictions.

Transaction Profile

- ICEBERG Role: Sell-side adviser.
- Guide price:
  US $150k per patent family, for families 1 - 26
  US $200k for family 27
  US $250k per patent family, for families 28, 29
  US $300k for family 30
  US $900k for family 31
- Grantback license required.
- Indication of interest requested to be submitted by: 19th June 2015.

Appendix

- Evidence of Use analysis suggesting infringement by Autodesk and Saelig, Cisco and Fluke Network; and mapping for one patent against 3GPP / LTE-A Standard.

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Seller information

Seoul National University is a national Research university founded in 1946. Located in Seoul. It is widely considered to be the most prestigious university in Korea

The institute was ranked 20th in publications by a 2008 analysis of data from Science Citation Index

QS World University Rankings considered it 31st in the world and 4th in Asia.

Seoul National University is ranked 5th in the world in terms of the number of alumni holding CEO positions in the Fortune 500 enterprises.

http://en.snu.ac.kr/

> “In 2006, marking its 60th anniversary, Seoul National University unveiled a special emblem and slogan to specify its goals for the future.”

60th Anniversary
Seoul National University

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Patent List (1 of 4)

Family	US Patent	US	JP	CN	DE	EP	Priority	Title
1	6770497	●	●		●		19/12/2000	Field emission emitter
2	8149187	●	●				23/07/2007	Organic light emitting display
3	7136031	●	●				18/12/2000	Reflecting three-dimensional display system
4	8427398	●					03/12/2004	Picture element structure of current programming method type active matrix organic emitting diode display and driving method of data line
5	7041518	●	●	●			26/12/2002	Low-temperature formation method for emitter tip including copper oxide nanowire or copper nanowire and display device or light source having emitter tip manufactured using the same
6	7526047	●					27/06/2003	Method for encoding a message into geometrically uniform space-time trellis codes
7	7505397	●	●	●		●	16/06/2004	Method for transmitting/receiving data in mobile communication systems using an ofdma scheme
8	7792138	●					13/09/2006	Distributed opportunistic scheduling in ieee 802.11 wireless location area networks (wlans)
9	7773558	●					26/12/2006	Wireless network channel allocation method and multi-hop wireless network system using the same

Patent List (2 of 4)

Family	US Patent	US	JP	CN	DE	EP	Priority	Title
10	7746837	●					31/01/2007	Overhear-based transmitting control system in wlans
11	7957286	●					09/02/2007	Method for estimating optimized transmission bit rate in wireless local area network system
12	7929414	●					29/05/2007	Modified slm scheme with low complexity for papr reduction of ofdm systems
13	8509052	●					07/05/2008	Channel information generating device and method for spatial division multiplexing algorithm in a wireless communication system, and data transmission apparatus and method adopting the same
14	8108387	●					01/08/2008	Method of detecting character string pattern at high speed using layered shift tables
15	8583051	●					04/08/2008	Apparatus for removing interference between neighbor cells in a radio communication system, and method for same
16	8340596	●					11/08/2008	Signal transmission apparatus and method using eigen antenna technique in wireless communication system
17	8761227	●					27/10/2008	Apparatus and method for avoiding interference noise in fhss system
18	8699400	●					20/05/2009	Source antenna switching scheme for non-orthogonal protocol
19	8457143	●					20/07/2009	Method for lossless handover in vehicular wireless networks

Patent List (3 of 4)

Family	US Patent	US	JP	CN	DE	EP	Priority	Title
20	8472392	●					15/07/2009	Access point for providing wlan virtualization, wlan virtualization system and method of providing access to wireless communication network
21	8693568	●					25/11/2009	Method and apparatus for estimating channel using dedicated pilot signal in ofdm-based wireless communication system
22	8488574	●					14/06/2010	Wireless network system and association control method thereof
23	8468430	●					03/09/2010	Product code decoding method and device
24	8599809	●					26/11/2010	Routing method for wireless mesh networks and wireless mesh network system using the same
25	8677195	●					24/02/2011	Data transmission method using ack transmission opportunity in wireless network
26	8478292	●					19/08/2011	Wireless localization method based on an efficient multilateration algorithm over a wireless sensor network and a recording medium in which a program for the method is recorded

Patent List (4 of 4)

Family	US Patent	US	JP	CN	DE	EP	Priority	Title
27	7397808*	●					31/10/2002	Parallel switching architecture for multiple input/output
28	7493243*	●				●	27/12/2004	Method and system of real-time graphical simulation of large rotational deformation and manipulation using modal warping
29	8631331*	●					16/10/2009	Apparatus for network traffic classification benchmark
30	7684854*	●					31/08/2004	Apparatus and method for measuring electric non-contact electrocardiogram in everyday life
31	7773949*	●					23/06/2006	Multi-transmission/reception antenna device and multi-transmission/ reception method in multi-user and multi-cell environment

*** Key patents** – see Appendix

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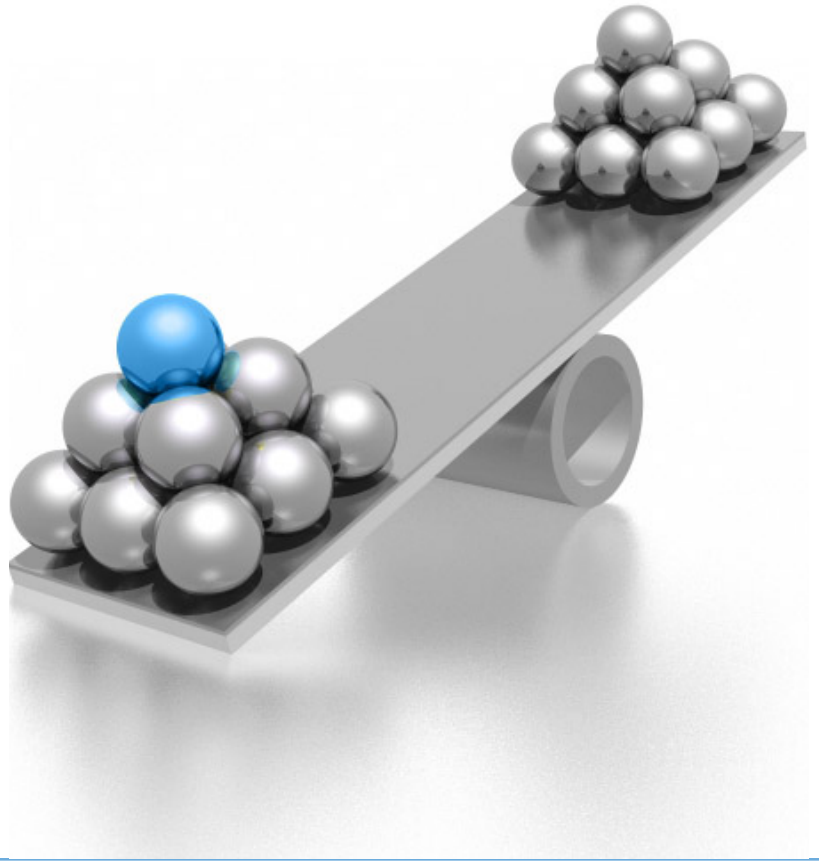
Appendix

Evidence of Use



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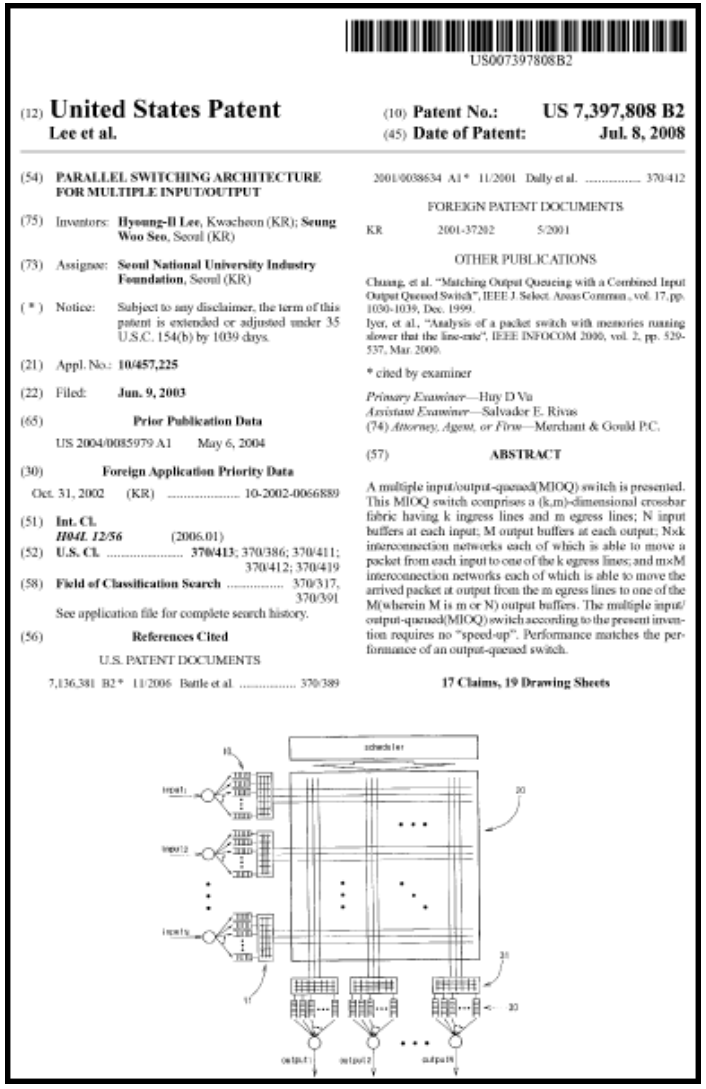
US 7397808 – Bibliographic information



US007397808B2

(12) **United States Patent**
Lee et al.

(10) **Patent No.: US 7,397,808 B2**
(45) **Date of Patent: Jul. 8, 2008**

(54) **PARALLEL SWITCHING ARCHITECTURE FOR MULTIPLE INPUT/OUTPUT**

(75) Inventors: **Hyoung-Il Lee**, Kwacheon (KR); **Seung Woo Seo**, Seoul (KR)

(73) Assignee: **Seoul National University Industry Foundation**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1039 days.

(21) Appl. No.: **10/457,225**

(22) Filed: **Jun. 9, 2003**

(65) **Prior Publication Data**

US 2004/0085979 A1 May 6, 2004

(30) **Foreign Application Priority Data**

Oct. 31, 2002 (KR) 10-2002-0066889

(51) **Int. Cl.**
H04L 12/56 (2006.01)

(52) **U.S. Cl.** **370/413**; 370/386; 370/411; 370/412; 370/419

(58) **Field of Classification Search** 370/317, 370/391

See application file for complete search history.

(56) **References Cited**

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7,136,381 B2 * 11/2006 Battle et al. 370/389
2001/0038634 A1 * 11/2001 Dally et al. 370/412

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Chuang, et al. "Matching Output Queueing with a Combined Input Output Queued Switch", IEEE J. Select. Areas Commun., vol. 17, pp. 1030-1039, Dec. 1999.
Iyer, et al., "Analysis of a packet switch with memories running slower that the line-rate", IEEE INFOCOM 2000, vol. 2, pp. 529-537, Mar. 2000.

* cited by examiner

Primary Examiner—Huy D Vu
Assistant Examiner—Salvador E. Rivas
(74) *Attorney, Agent, or Firm*—Merchant & Gould P.C.

(57) **ABSTRACT**

A multiple input/output-queued(MIOQ) switch is presented. This MIOQ switch comprises a (k,m)-dimensional crossbar fabric having k ingress lines and m egress lines; N input buffers at each input; M output buffers at each output; Nxk interconnection networks each of which is able to move a packet from each input to one of the k egress lines; and mxM interconnection networks each of which is able to move the arrived packet at output from the m egress lines to one of the M(wherein M is m or N) output buffers. The multiple input/output-queued(MIOQ) switch according to the present invention requires no "speed-up". Performance matches the performance of an output-queued switch.

17 Claims, 19 Drawing Sheets

Patent of Interest:

US7397808
(Priority date: Oct 31, 2002)

Parallel switching architecture for multiple input/ output

Exemplary Market Applications:

Technology disclosed have applications in the following sectors:

- In optical communication, for very high-speed switch/router for good internet speed.
- Used in data centers, to increase the efficiency and performance.
- In minimizing the cost, by reducing the number of switches/routers used.

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US 7397808 – Claim 1

1. A multiple input/output-queued switch of which size is N comprising:

a (k,m)-dimensional crossbar fabric having k ingress lines at each input and m egress lines at each output;

N input buffers at each input;

M output buffers at each output;

N×k interconnection networks each of which is able to move up to k packets from the N input buffers to the k ingress lines; and

m×M interconnection networks each of which is able to move up to m packets arrived at each output from the m egress lines to the M (wherein M is equal to or more than m) output buffers.

US 7397808 – EoU Summary

Cisco Nexus 5000 Series	
Key claim(s)	1 (independent claim)
Mapped product	Chart has been made with respect to Cisco Nexus 5000 Series
Source	Product information available at: http://www.cisco.com/c/en/us/products/collateral/switches/nexus-5020-switch/white_paper_c11-462176.pdf
Publication date	Not earlier than 2008
Details of product / company	Cisco Systems, Inc. is an American multinational corporation headquartered in San Jose, California, that designs, manufactures, and sells networking equipment. Product provided by Cisco includes routers, switches, wireless systems, security systems, WAN acceleration, energy and building management systems and media aware networks etc. The Cisco Nexus Series switches are modular network switches designed for the data center. Cisco Systems introduced the Nexus Series of switches on January 28, 2008.

US 7397808 – Cisco Nexus 5000 Series: Overview

The Nexus 5000 series is a range of 5 models 1U or 2U rack-switches offering 20 to 96 interfaces running on 1 or 10Gb ethernet and 10 Gb FCoE interfaces. They can be used with the Nexus 2000 series fabric extender. The 5000-series offer carrier-grade layer2 and layer3 switching as well as the mentioned FCoE capabilities. The 5 models are: Nexus 5010, Nexus 5020, Nexus 5548, Nexus 5596UP, & Nexus 5596T.

Cisco® offers a better solution to these challenges in the form of the Cisco® Nexus 5000 Series Switches. Designed as access-layer switches for in-rack deployment, the Cisco Nexus 5000 Series helps simplify data center infrastructure and reduce total cost of ownership (TCO). It supports I/O consolidation at the rack level, reducing the number of adapters, cables, switches, and transceivers that each server must support, all while protecting investment in existing storage assets.

The Cisco Nexus 5000 Series delivers these benefits to data centers through the following product features:

- **High performance 10 Gigabit Ethernet:** The Cisco Nexus 5000 Series is a family of line-rate, low-latency, cost-effective 10 Gigabit switches designed for access-layer applications.
- **Fibre Channel over Ethernet (FCoE):** The Cisco Nexus 5000 Series is the first open-standards-based access-layer switch to support I/O consolidation at the rack level through FCoE.
- **IEEE Data Center Bridging (DCB):** The switch family incorporates a series of Ethernet enhancements designed for the data center, including flow control and network congestion management.
- **VM Optimized Services:** The switch family supports end-port virtualization and virtual machine optimized services, helping increase the scalability of virtual Layer 2 networks and enhancing application performance and security.

Source:
http://www.cisco.com/c/en/us/products/collateral/switches/nexus-5020-switch/white_paper_c11-462176.pdf

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US 7397808 – Claim 1 vs. Cisco Nexus 5000 Series

Claim	Nexus 5000 Series
1. A multiple input/output-queued switch of which size is N comprising: a (k,m)-dimensional crossbar fabric having k ingress lines at each input and m egress lines at each output; N input buffers at each input; M output buffers at each output; N×k interconnection networks each of which is able to move up to k packets from the N input buffers to the k ingress lines; and m×M interconnection networks each of which is able to move up to m packets arrived at each output from the m egress lines to the M (wherein M is equal to or more than m) output buffers.	The Cisco Nexus 5000 Series uses a scalable cut-through input queuing switching architecture. The architecture is implemented primarily by two ASICs developed by Cisco: • A set of unified port controllers (UPCs) that perform data plane processing • A unified crossbar fabric (UCF) that cross-connects the UPCs Each UPC manages 4 10 Gigabit Ethernet/FCoE ports and makes forwarding decisions for the packets received on those ports. After a forwarding decision is made, the packets are queued in VOQs, waiting to be granted access to the UCF. (Because of the cut-through characteristics of the architecture, packets are queued and dequeued before the full packet contents have been received and buffered on the ingress port.) The UCF is responsible for coupling ingress UPCs to available egress UPCs, and it internally connects each 10 Gigabit Ethernet/FCoE interface through fabric interfaces running at 12 Gbps. This 20 percent over speed helps ensure line-rate throughput regardless of the packet manipulation performed in the ASICs. **Researcher's Comment:** Nexus 5000 series switch follows Queue Switching Architecture, in which virtual queues are formed for data packets from buffer. Also, it contains multiple ingress ports and egress ports which are managed by UCF. Source: http://www.cisco.com/c/en/us/products/collateral/switches/nexus-5020-switch/white_paper_c11-462176.pdf

US 7397808 – Claim 1 vs. Cisco Nexus 5000 Series

Claim	Nexus 5000 Series
1. A multiple input/output-queued switch of which size is N comprising: **a (k,m)-dimensional crossbar fabric having k ingress lines at each input and m egress lines at each output;** N input buffers at each input; M output buffers at each output; N×k interconnection networks each of which is able to move up to k packets from the N input buffers to the k ingress lines; and m×M interconnection networks each of which is able to move up to m packets arrived at each output from the m egress lines to the M (wherein M is equal to or more than m) output buffers.	virtualization capabilities. Internally, the switches are based on only two custom application-specific integrated circuits (ASICs): a unified port controller that handles all packet-processing operations on ingress and egress, and unified crossbar fabric that schedules and switches packets. Every design decision made in these two devices is precisely targeted to support I/O consolidation and virtualization features with the most efficient use of transistor logic, helping minimize power consumption and maximize performance. The Cisco Nexus 5000 Series uses a scalable cut-through input queuing switching architecture. The architecture is implemented primarily by two ASICs developed by Cisco: • A set of unified port controllers (UPCs) that perform data plane processing • A unified crossbar fabric (UCF) that cross-connects the UPCs Each UPC manages 4 10 Gigabit Ethernet/FCoE ports and makes forwarding decisions for the packets received on those ports. After a forwarding decision is made, the packets are queued in VOQs, waiting to be granted access to the UCF. (Because of the cut-through characteristics of the architecture, packets are queued and dequeued before the full packet contents have been received and buffered on the ingress port.) The UCF is responsible for coupling ingress UPCs to available egress UPCs, and it internally connects each 10 Gigabit Ethernet/FCoE interface through fabric interfaces running at 12 Gbps. This 20 percent over speed helps ensure line-rate throughput regardless of the packet manipulation performed in the ASICs. **Researcher's Comment:** Nexus 5000 series switch contains unified crossbar fabric(UCF), which cross-connects multiple ingress(at input) and egress(at output) ports. Source: http://www.cisco.com/c/en/us/products/collateral/switches/nexus-5020-switch/white_paper_c11-462176.pdf

US 7397808 – Claim 1 vs. Cisco Nexus 5000 Series

Claim	Nexus 5000 Series
1. A multiple input/output-queued switch of which size is N comprising: a (k,m)-dimensional crossbar fabric having k ingress lines at each input and m egress lines at each output; **N input buffers at each input;** **M output buffers at each output;** N×k interconnection networks each of which is able to move up to k packets from the N input buffers to the k ingress lines; and m×M interconnection networks each of which is able to move up to m packets arrived at each output from the m egress lines to the M (wherein M is equal to or more than m) output buffers.	All input buffering is performed by the UPC, so the UCF does not have any input buffer. For each packet, a request is sent to scheduler. There are, however, four fabric buffers and four crosspoints per egress interface, with 10,240 bytes of memory per buffer. Three fabric buffers are used for unicast packets, and one is reserved for a multicast packet. The four buffers allow use of the fabric to be granted to four ingress ports in parallel, resulting in a 300 percent speedup for unicast packets. The buffers are sent out in first-in, first-out (FIFO) order to the egress queues in the UPC, building a certain egress pipeline to fill up the egress bandwidth on the corresponding UPC and to increase throughput. The buffering strategy on the UPC includes ingress and egress buffers from the pool of 480 KB memory. Ingress buffering constitutes the majority of the buffering needs, and therefore most buffers are assigned to the ingress side; egress buffering is used mainly to sustain flow control for both Ethernet and Fibre Channel and to create an egress pipeline to increase throughput. **Researcher's Comment:** This represents that UPC has multiple buffers at input which are feed into ingress line. Likewise, output buffers are there which feed into egress port. Source: http://www.cisco.com/c/en/us/products/collateral/switches/nexus-5020-switch/white_paper_c11-462176.pdf

US 7397808 – Claim 1 vs. Cisco Nexus 5000 Series

Claim	Nexus 5000 Series
1. A multiple input/output-queued switch of which size is N comprising: a (k,m)-dimensional crossbar fabric having k ingress lines at each input and m egress lines at each output; N input buffers at each input; M output buffers at each output; **N×k interconnection networks each of which is able to move up to k packets from the N input buffers to the k ingress lines; and** m×M interconnection networks each of which is able to move up to m packets arrived at each output from the m egress lines to the M (wherein M is equal to or more than m) output buffers.	The buffering strategy on the UPC includes ingress and egress buffers from the pool of 480 KB memory. Ingress buffering constitutes the majority of the buffering needs, and therefore most buffers are assigned to the ingress side; egress buffering is used mainly to sustain flow control for both Ethernet and Fibre Channel and to create an egress pipeline to increase throughput. All input buffering is performed by the UPC, so the UCF does not have any input buffer. For each packet, a request is sent to scheduler. There are, however, four fabric buffers and four crosspoints per egress interface, with 10,240 bytes of memory per buffer. Three fabric buffers are used for unicast packets, and one is reserved for a multicast packet. The four buffers allow use of the fabric to be granted to four ingress ports in parallel, resulting in a 300 percent speedup for unicast packets. The buffers are sent out in first-in, first-out (FIFO) order to the egress queues in the UPC, building a certain egress pipeline to fill up the egress bandwidth on the corresponding UPC and to increase throughput. **Researcher's Comment:** In ingress buffering, data is forwarded from input buffer to ingress port in FIFO order, at UPC. Source: http://www.cisco.com/c/en/us/products/collateral/switches/nexus-5020-switch/white_paper_c11-462176.pdf

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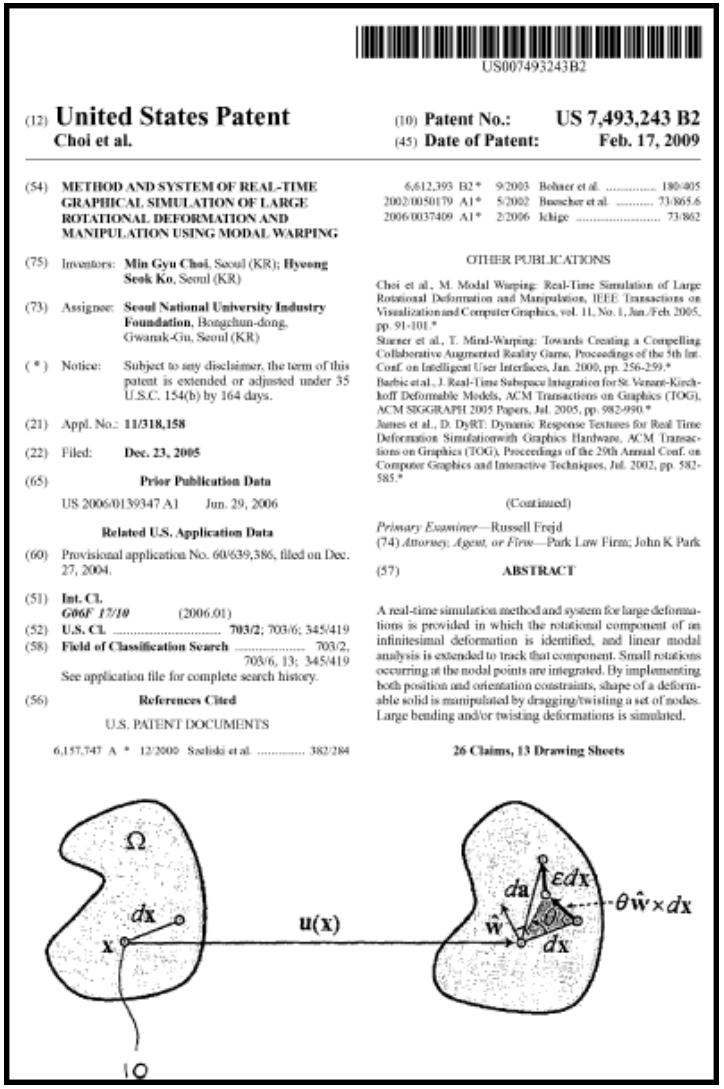
US 7397808 – Claim 1 vs. Cisco Nexus 5000 Series

Claim	Nexus 5000 Series
1. A multiple input/output-queued switch of which size is N comprising: a (k,m)-dimensional crossbar fabric having k ingress lines at each input and m egress lines at each output; N input buffers at each input; M output buffers at each output; N×k interconnection networks each of which is able to move up to k packets from the N input buffers to the k ingress lines; and **m×M interconnection networks each of which is able to move up to m packets arrived at each output from the m egress lines to the M (wherein M is equal to or more than m) output buffers.**	The buffering strategy on the UPC includes ingress and egress buffers from the pool of 480 KB memory. Ingress buffering constitutes the majority of the buffering needs, and therefore most buffers are assigned to the ingress side; egress buffering is used mainly to sustain flow control for both Ethernet and Fibre Channel and to create an egress pipeline to increase throughput. **Researcher's Comment:** In egress buffering, data is forwarded from egress port to buffer in FIFO order, at UPC. Source: http://www.cisco.com/c/en/us/products/collateral/switches/nexus-5020-switch/white_paper_c11-462176.pdf

US 7493243 – Bibliographic information



US007493243B2

(12) **United States Patent**
Choi et al.

(10) **Patent No.: US 7,493,243 B2**
(45) **Date of Patent: Feb. 17, 2009**

(54) **METHOD AND SYSTEM OF REAL-TIME GRAPHICAL SIMULATION OF LARGE ROTATIONAL DEFORMATION AND MANIPULATION USING MODAL WARPING**

(75) Inventors: **Min Gyu Choi**, Seoul (KR); **Hyeong Seok Ko**, Seoul (KR)

(73) Assignee: **Seoul National University Industry Foundation**, Bongchun-dong, Gwanak-Gu, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 164 days.

(21) Appl. No.: **11/318,158**

(22) Filed: **Dec. 23, 2005**

(65) **Prior Publication Data**

US 2006/0139347 A1 Jun. 29, 2006

Related U.S. Application Data

(60) Provisional application No. 60/639,386, filed on Dec. 27, 2004.

(51) **Int. Cl.**
G06F 17/10 (2006.01)

(52) **U.S. Cl.** **703/2**; 703/6; 345/419

(58) **Field of Classification Search** 703/2, 703/6, 13; 345/419

See application file for complete search history.

(56) **References Cited**

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2006/0037409 A1 * 2/2006 Ichige 73/862

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Barbic et al., J. Real-Time Subspace Integration for St. Venant-Kirchhoff Deformable Models, ACM Transactions on Graphics (TOG), ACM SIGGRAPH 2005 Papers, Jul. 2005, pp. 982-990.*
James et al., D. DyRT: Dynamic Response Textures for Real Time Deformation Simulationwith Graphics Hardware, ACM Transactions on Graphics (TOG), Proceedings of the 29th Annual Conf. on Computer Graphics and Interactive Techniques, Jul. 2002, pp. 582-585.*

(Continued)

Primary Examiner—Russell Frejd
(74) *Attorney, Agent, or Firm*—Park Law Firm; John K. Park

(57) **ABSTRACT**

A real-time simulation method and system for large deformations is provided in which the rotational component of an infinitesimal deformation is identified, and linear modal analysis is extended to track that component. Small rotations occurring at the nodal points are integrated. By implementing both position and orientation constraints, shape of a deformable solid is manipulated by dragging/twisting a set of nodes. Large bending and/or twisting deformations is simulated.

26 Claims, 13 Drawing Sheets

Patent of Interest:

US7493243
(Priority date: DEC 27, 2004)

Method and system of real-time graphical simulation of large rotational deformation and manipulation using modal warping

Exemplary Market Applications:

Technology disclosed may be used:

- To model elastic solids as continua
- For large bending and/or twisting deformations with acceptable realism of objects or creatures such that it appear natural.
- In real-time graphical simulation of large rotational deformation and manipulation in small time.

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US 7493243 – Claim 1

1. A method for simulating large rotational deformation and manipulating mesh nodes mapping an object using modal warping comprising the steps of:

   a) mapping the information of geometry of material points of an object by a mesh of nodes;

   b) calculating the change of geometry of the mesh of nodes using a predetermined and limited number of equations of motion by applying modal warping to the position and the rotation at each mesh node;

   c) pre-computing time-independent standard modal calculations;

   d) looking up results of the step of pre-computing;

   e) updating the position and the rotation at each mesh node; and

   f) displaying mesh nodes at the updated positions.

US 7493243 – EoU Summary

Autodesk 3DS Max	
Key claim(s)	1 (independent claim)
Mapped product	Chart has been made with respect to Visual TruView The product is available at: http://docs.autodesk.com/3DSMAX/15/ENU/3ds-Max-Help/index.html?url=files/GUID-854DBB14-3660-442C-B248-BE048620DE02.htm,topicNumber=d30e5285
Source	Product information available at: http://docs.autodesk.com/3DSMAX/15/ENU/3ds-Max-Help/index.html?url=files/GUID-D46089E2-26A1-4889-952B-D1962407378E.htm,topicNumber=d30e178918 http://knowledge.autodesk.com/support/3ds-max/learn-explore/caas/CloudHelp/cloudhelp/2015/ENU/3DSMax/files/GUID-F6B90AEA-5BFE-4DB7-83CB-2FB6CC4AD390-htm.html
Publication date	Not earlier than 2005
Details of product / company	Autodesk, Inc., is a leader in 3D design, engineering and entertainment software. They first introduce AutoCAD software in 1982, Autodesk continues to develop the broadest portfolio of state-of-the-art 3D software for global markets. The very first product, 3D Studio, was created for the DOS platform and then the product was rewritten for the Windows NT platform, and renamed "3D Studio MAX". Everyone across the manufacturing, architecture, building, construction, and media and entertainment industries use Autodesk software to design, visualize, and simulate their ideas before they're ever built or created.

US 7493243 – Autodesk 3DS Max: Overview

Autodesk 3ds Max, formerly 3D Studio Max, is a professional 3D computer graphics program for making 3D animations, models, games and images. It has modeling capabilities, a flexible plugin architecture and can be used on the Microsoft Windows platform. It is frequently used by video game developers, many TV commercial studios and architectural visualization studios. It is also used for movie effects and movie pre-visualization. The latest version of 3ds Max also features shaders (such as ambient occlusion and subsurface scattering), dynamic simulation, particle systems, radiosity, normal map creation and rendering, global illumination, a customizable user interface, and its own scripting language

Autodesk 3ds Max 2013 and Autodesk 3ds Max Design 2012 provide 3D modeling, animation, and rendering for use in design visualization, games, film, and television.

Old Metal Train
Vincent Dany
Copyright © 2008

Source:
http://docs.autodesk.com/3DSMAX/15/ENU/3ds-Max-Help/index.html?url=files/GUID-854DBB14-3660-442C-B248-BE048620DE02.htm,topicNumber=d30e5285

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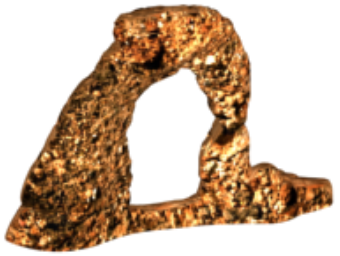
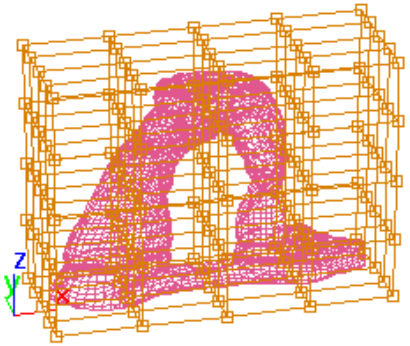
US 7493243 – Claim 1 vs. Autodesk 3DS Max

Claim	Autodesk 3DS Max
1. A method for simulating large rotational deformation and manipulating mesh nodes mapping an object using modal warping comprising the steps of: a) mapping the information of geometry of material points of an object by a mesh of nodes; b) calculating the change of geometry of the mesh of nodes using a predetermined and limited number of equations of motion by applying modal warping to the position and the rotation at each mesh node; c) pre-computing time-independent standard modal calculations; d) looking up results of the step of pre-computing; e) updating the position and the rotation at each mesh node; and f) displaying mesh nodes at the updated positions.	To change an object's position, orientation, or scale, click one of the three transform buttons on the main toolbar or choose a transform from a shortcut menu. Apply the transform to a selected object using the mouse, the status bar Coordinate Display fields, a type-in dialog, or any combination of the above. Space warps and particle systems are additional modeling tools. Space warps are "force fields" that deform other objects, creating the effect of ripples, waves, blowing wind, and so on. Particle systems generate particle sub-objects for the purpose of simulating snow, rain, dust, and so on. (You use particle systems primarily in animations.) Free-form deformations (FFDs) provide a method of deforming an object by adjusting the control points of a lattice. The offset position of the control points to the original lattice source volume causes the distortion of the affected object. The FFD(Box) space warp is a box-shaped lattice FFD object similar to the original FFD modifiers. This FFD is available as both an object modifier and a space warp. For information on the object-modifier version, see FFD (Box/Cylinder) Modifiers. **Researcher's Comment:** 3DS Max is a software, used for simulating deformation in objects. Space Warping is one of the modelling tool in it, which uses control points for mapping like mesh nodes mapping Source: http://docs.autodesk.com/3DSMAX/15/ENU/3ds-Max-Help/index.html?url=files/GUID-854DBB14-3660-442C-B248-BE048620DE02.htm,topicNumber=d30e5285

ICEBERG CAPITAL PARTNERS

US 7493243 – Claim 1 vs. Autodesk 3DS Max

Claim	Autodesk 3DS Max
1. A method for simulating large rotational deformation and manipulating mesh nodes mapping an object using modal warping comprising the steps of: **a) mapping the information of geometry of material points of an object by a mesh of nodes;** b) calculating the change of geometry of the mesh of nodes using a predetermined and limited number of equations of motion by applying modal warping to the position and the rotation at each mesh node; c) pre-computing time-independent standard modal calculations; d) looking up results of the step of pre-computing; e) updating the position and the rotation at each mesh node; and f) displaying mesh nodes at the updated positions.	You create FFD space warps as separate objects similarly to the way you create standard primitives: by dragging the mouse in the viewport. The result is a lattice of control points. The source lattice of an FFD modifier is fitted to the geometry it's assigned to in the stack. This might be a whole object or a sub-object selection of faces or vertices.   **Object and object surrounded by an FFD lattice** **Researcher's Comment:** Here, Object is mapped in FFD lattice using control points Source: http://docs.autodesk.com/3DSMAX/15/ENU/3ds-Max-Help/index.html?url=files/GUID-D46089E2-26A1-4889-952B-D1962407378E.htm,topicNumber=d30e178918

ICEBERG CAPITAL PARTNERS

US 7493243 – Claim 1 vs. Autodesk 3DS Max

Claim	Autodesk 3DS Max
1. A method for simulating large rotational deformation and manipulating mesh nodes mapping an object using modal warping comprising the steps of: a) mapping the information of geometry of material points of an object by a mesh of nodes; **b) calculating the change of geometry of the mesh of nodes using a predetermined and limited number of equations of motion by applying modal warping to the position and the rotation at each mesh node;** c) pre-computing time-independent standard modal calculations; d) looking up results of the step of pre-computing; e) updating the position and the rotation at each mesh node; and f) displaying mesh nodes at the updated positions.	**Simulate** Creates a simulation over the active time segment. Unlike Simulate Local, this creates animation data in the form of a simulation cache at every frame. The simulator advances by a time step called dT. The initial value is the Step setting on the Simulation Parameters rollout. When the simulator encounters certain situations, it decreases dT in order to overcome the obstacles. Sometime later, the simulator increases dT again up to the maximum Step value you set. The current value of dT appears on the Cloth Simulation dialog that shows the progress of the simulation as it takes place (see following). When the simulator decreases dT, it shows "dT decreased" on the Cloth Simulation dialog along with one of the following messages (explanation follows each message): • could not solve equations – The solver could not solve the equations of motion. • cloth has become over-stretched – In attempting to solve one step, some edges of the cloth became too elongated, indicating a failure of the solver.

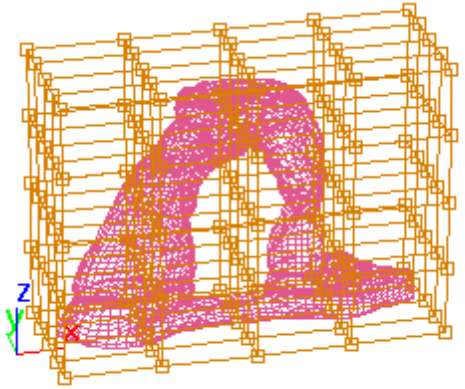
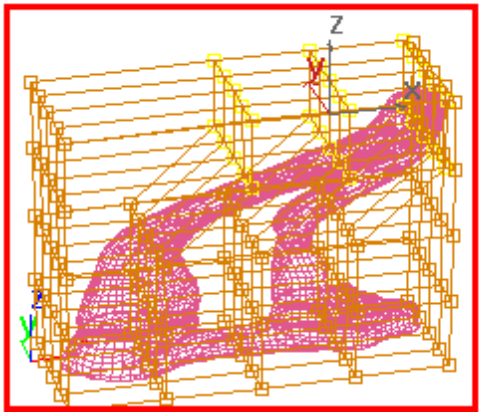
Researcher's Comment: This represents simulator for a cloth(i.e. object), which creates(calculates) animation data using equations of motion. These equation uses information of each control points to output final simulated data.

Source:
http://knowledge.autodesk.com/support/3ds-max/learn-explore/caas/CloudHelp/cloudhelp/2015/ENU/3DSMax/files/GUID-F6B90AEA-5BFE-4DB7-83CB-2FB6CC4AD390-htm.html

US 7493243 – Claim 1 vs. Autodesk 3DS Max

Claim	Autodesk 3DS Max
1. A method for simulating large rotational deformation and manipulating mesh nodes mapping an object using modal warping comprising the steps of: a) mapping the information of geometry of material points of an object by a mesh of nodes; b) calculating the change of geometry of the mesh of nodes using a predetermined and limited number of equations of motion by applying modal warping to the position and the rotation at each mesh node; **c) pre-computing time-independent standard modal calculations;** d) looking up results of the step of pre-computing; e) updating the position and the rotation at each mesh node; and f) displaying mesh nodes at the updated positions.	Because FFD space warps are separate objects, they carry their own adjustable dimension parameters among the creation parameters. **Researcher's Comment:** FFD space warps have their separate predefined standard dimension parameters, which are not dependent on time. Source: http://docs.autodesk.com/3DSMAX/15/ENU/3ds-Max-Help/index.html?url=files/GUID-D46089E2-26A1-4889-952B-D1962407378E.htm,topicNumber=d30e178918

US 7493243 – Claim 1 vs. Autodesk 3DS Max

Claim	Autodesk 3DS Max
1. A method for simulating large rotational deformation and manipulating mesh nodes mapping an object using modal warping comprising the steps of: a) mapping the information of geometry of material points of an object by a mesh of nodes; b) calculating the change of geometry of the mesh of nodes using a predetermined and limited number of equations of motion by applying modal warping to the position and the rotation at each mesh node; c) pre-computing time-independent standard modal calculations; **d) looking up results of the step of pre-computing;** e) updating the position and the rotation at each mesh node; and f) displaying mesh nodes at the updated positions.	 Object and object surrounded by an FFD lattice  Source: http://docs.autodesk.com/3DSMAX/15/ENU/3ds-Max-Help/index.html?url=files/GUID-D46089E2-26A1-4889-952B-D1962407378E.htm,topicNumber=d30e178918

Researcher's Comment: Here, figure shows the outcome of pre-computing. Some of the control points are shifted.

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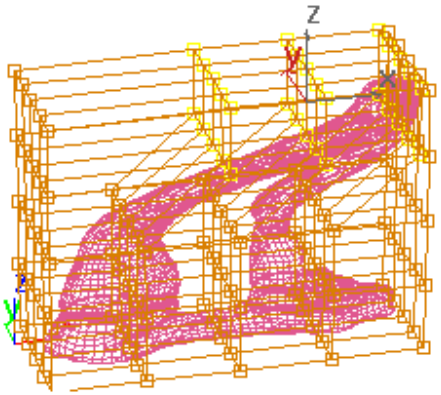
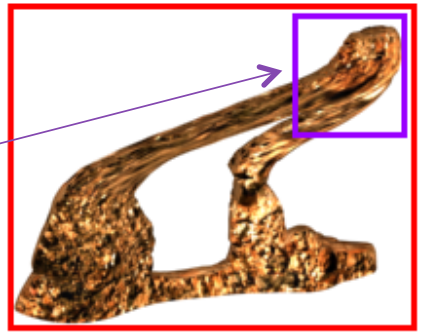
US 7493243 – Claim 1 vs. Autodesk 3DS Max

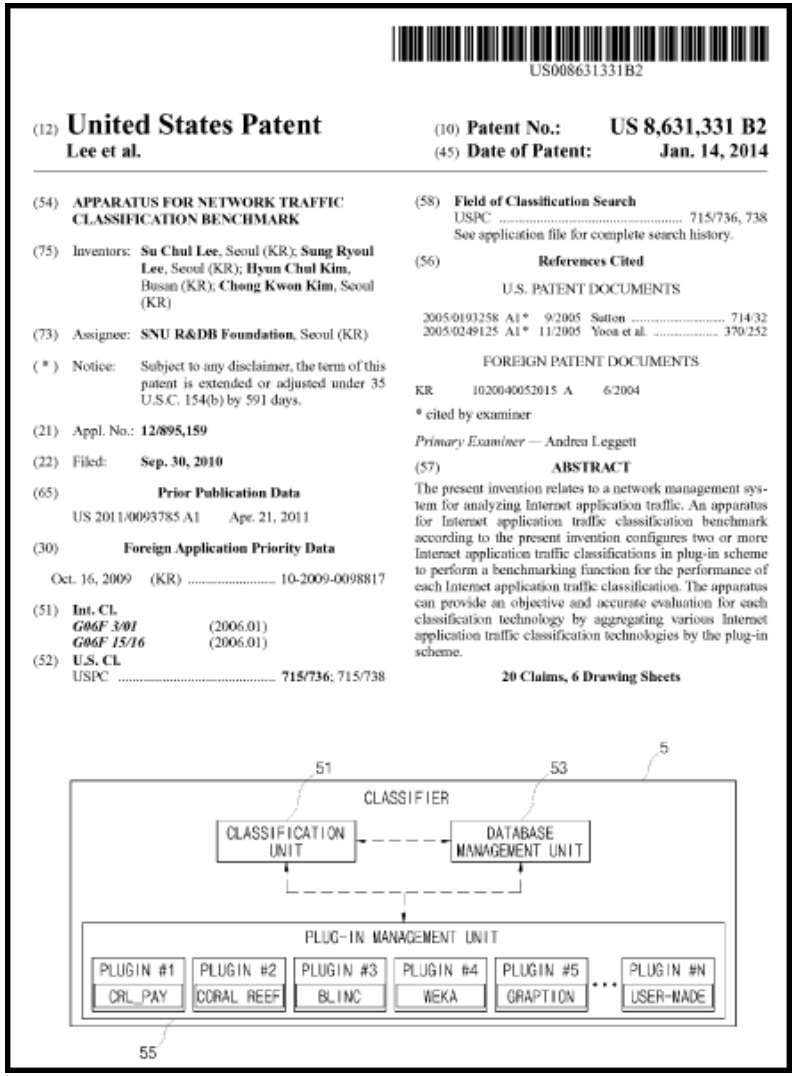
Claim	Autodesk 3DS Max
1. A method for simulating large rotational deformation and manipulating mesh nodes mapping an object using modal warping comprising the steps of: a) mapping the information of geometry of material points of an object by a mesh of nodes; b) calculating the change of geometry of the mesh of nodes using a predetermined and limited number of equations of motion by applying modal warping to the position and the rotation at each mesh node; c) pre-computing time-independent standard modal calculations; d) looking up results of the step of pre-computing; **e) updating the position and the rotation at each mesh node; and** **f) displaying mesh nodes at the updated positions.**	  Moving control points in the lattice deforms the object.

Researcher's Comment: Figure shows the deformed object with position of few control points changed.

Source: http://docs.autodesk.com/3DSMAX/15/ENU/3ds-Max-Help/index.html?url=files/GUID-D46089E2-26A1-4889-952B-D1962407378E.htm,topicNumber=d30e178918

ICEBERG CAPITAL PARTNERS

US 8631331 – Bibliographic information



US008631331B2

(12) **United States Patent**
Lee et al.

(10) **Patent No.: US 8,631,331 B2**
(45) **Date of Patent: Jan. 14, 2014**

(54) **APPARATUS FOR NETWORK TRAFFIC CLASSIFICATION BENCHMARK**

(75) Inventors: **Su Chul Lee**, Seoul (KR); **Sung Ryoul Lee**, Seoul (KR); **Hyun Chul Kim**, Busan (KR); **Chong Kwon Kim**, Seoul (KR)

(73) Assignee: **SNU R&DB Foundation**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 591 days.

(21) Appl. No.: **12/895,159**

(22) Filed: **Sep. 30, 2010**

(65) **Prior Publication Data**

US 2011/0093785 A1 Apr. 21, 2011

(30) **Foreign Application Priority Data**

Oct. 16, 2009 (KR) 10-2009-0098817

(51) **Int. Cl.**
G06F 3/01 (2006.01)
G06F 15/16 (2006.01)

(52) **U.S. Cl.**
USPC **715/736**; 715/738

(58) **Field of Classification Search**
USPC 715/736, 738
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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FOREIGN PATENT DOCUMENTS

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* cited by examiner

Primary Examiner — Andrea Leggett

(57) **ABSTRACT**

The present invention relates to a network management system for analyzing Internet application traffic. An apparatus for Internet application traffic classification benchmark according to the present invention configures two or more Internet application traffic classifications in plug-in scheme to perform a benchmarking function for the performance of each Internet application traffic classification. The apparatus can provide an objective and accurate evaluation for each classification technology by aggregating various Internet application traffic classification technologies by the plug-in scheme.

20 Claims, 6 Drawing Sheets

Patent of Interest:

US8631331
(Priority date: OCT 16, 2009)

Apparatus for network traffic classification benchmark

Exemplary Market Applications:

Technology disclosed have applications in the following sectors:

- Analyzing network traffic and thus, improving performance
- Used for measuring QOS value i.e. accuracy, precision etc. for a system/device.

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US 8631331 – Claim 15

15. A method of benchmarking network traffic classifications, comprising

receiving network traffic trace data;

converting the network traffic trace data into formats suitable for each of a plurality of classification plug-ins;

executing the plurality of classification plug-ins in connection with the network traffic trace data;

evaluating classification results from each of the plurality of the classification plug-ins;

calculating a set of performance metrics including overall accuracy, precision, recall and F-measure based on the classification results; and

storing the set of performance metrics in a database.

US 8631331 – EoU Summary

Fluke Network's Visual TruView	
Key claim(s)	1, 7, 9, 15 (independent claims)
Mapped product	Chart has been made with respect to Visual TruView The product is available at: http://www.flukenetworks.com/apps/truview
Source	Product information available at: http://www.flukenetworks.com/apps/truview http://www.flukenetworks.com/CSA-demo-download http://www.flukenetworks.com/findit/en-us/3780533 http://www.flukenetworks.com/content/datasheet-visual-performance-manager-and-truview-advanced-mpls-package-sku-01654
Publication date	Not earlier than 2009
Details of product / company	Backed by the financial strength of Danaher Corporation (NYSE: DHR), a $18B corporate parent company, Fluke Networks has remained profitable and grown significantly. Fluke Networks offers best of breed solutions that span network deployment, network performance management and troubleshooting, as well as security and performance monitoring. Products like Visual TruView™, ClearSight™ Analyzer, Network Time Machine and the OptiView XG Network Analysis Tablet are offered by company for analysing network traffic and performance.

US 8631331 – Visual TruView: Overview

TruView is an application and network performance monitoring and management tool which embeds the most important data sources such as packet, transaction, NetFlow/IPFIX, and SNMP and presents analytics in a time correlated single dashboard view. These correlated views will help you to quickly see how well the infrastructure is transporting applications and how well those applications are performing in context of the end user experience. And, TruView's integrated 10 Gbps full line rate stream-to-disk packet capture ensures you'll never miss an important event again, as verified by the Tolly Group independent performance test

Source: http://www.flukenetworks.com/apps/truview

ICEBERG CAPITAL PARTNERS

US 8631331 – Claim 15 vs. Fluke Network's Visual TruView

Claim	Visual TruView
15. A method of benchmarking network traffic classifications, comprising receiving network traffic trace data; converting the network traffic trace data into formats suitable for each of a plurality of classification plug-ins; executing the plurality of classification plug-ins in connection with the network traffic trace data; evaluating classification results from each of the plurality of the classification plug-ins; calculating a set of performance metrics including overall accuracy, precision, recall and F-measure based on the classification results; and storing the set of performance metrics in a database.	**ClearSight Analyzer application-centric analysis workflow** The ClearSight Analyzer automatically analyzes application flows, and can classify traffic by application such as HTTP, email, and VoIP to make it easy to see the flow of each transaction. You can also drill down from the flow view for a session to the packet level and reconstruct the application content. **Step 1: Start Monitor.** Network traffic monitoring starts automatically. Traffic is classified by application. Applications with problems and issues can easily be identified with Yellow or Red icons. The ClearSight Analyzer on the Visual TruView appliance provides an intuitive, easy-to-use interface for unparalleled application analysis. ClearSight shows the health of applications on your network and drills down to more detailed information. You don't have to be an expert packet decoder to solve application problems.

Researcher's Comment: ClearSight Analyzer is used in coordination with Visual TruView to classify network traffic by applications and marking issues/problems.

Source: http://www.flukenetworks.com/CSA-demo-download

US 8631331 – Claim 15 vs. Fluke Network's Visual TruView

Claim	Visual TruView
15. A method of benchmarking network traffic classifications, comprising **receiving network traffic trace data**; converting the network traffic trace data into formats suitable for each of a plurality of classification plug-ins; executing the plurality of classification plug-ins in connection with the network traffic trace data; evaluating classification results from each of the plurality of the classification plug-ins; calculating a set of performance metrics including overall accuracy, precision, recall and F-measure based on the classification results; and storing the set of performance metrics in a database.	**Comprehensive Traffic Report** CSA provides a large inventory of standard reports in chart and table formats showing statistics and performance for network traffic, servers, and applications. CSA generates reports from real-time data or trace files. See QoS reports for voice and video traffic, showing statistics Application-centric Summary Page Immediately see the problem layers and quickly determine overall application health from real-time traffic monitored or trace file **Researcher's Comment:** Here, ClearSight Analyser works on retrieved trace file, which contains network traffic data. Source: http://www.flukenetworks.com/findit/en-us/3780533

US 8631331 – Claim 15 vs. Fluke Network's Visual TruView

Claim	Visual TruView
15. A method of benchmarking network traffic classifications, comprising receiving network traffic trace data; **converting the network traffic trace data into formats suitable for each of a plurality of classification plug-ins; executing the plurality of classification plug-ins in connection with the network traffic trace data;** evaluating classification results from each of the plurality of the classification plug-ins; calculating a set of performance metrics including overall accuracy, precision, recall and F-measure based on the classification results; and storing the set of performance metrics in a database.	Application-centric Summary Page Immediately see the problem layers and quickly determine overall application health from real-time traffic monitored or trace file **ClearSight Analyzer application-centric analysis workflow** The ClearSight Analyzer automatically analyzes application flows, and can classify traffic by application such as HTTP, email, and VoIP to make it easy to see the flow of each transaction. You can also drill down from the flow view for a session to the packet level and reconstruct the application content. **Step 1: Start Monitor.** Network traffic monitoring starts automatically. Traffic is classified by application. Applications with problems and issues can easily be identified with Yellow or Red icons.

Researcher's Comment: This shows that as soon as ClearSight Analyser receives trace file, it classifies traffic by applications such as HTTP, email etc. by executing plugin for each application on trace data.

Source: http://www.flukenetworks.com/findit/en-us/3780533

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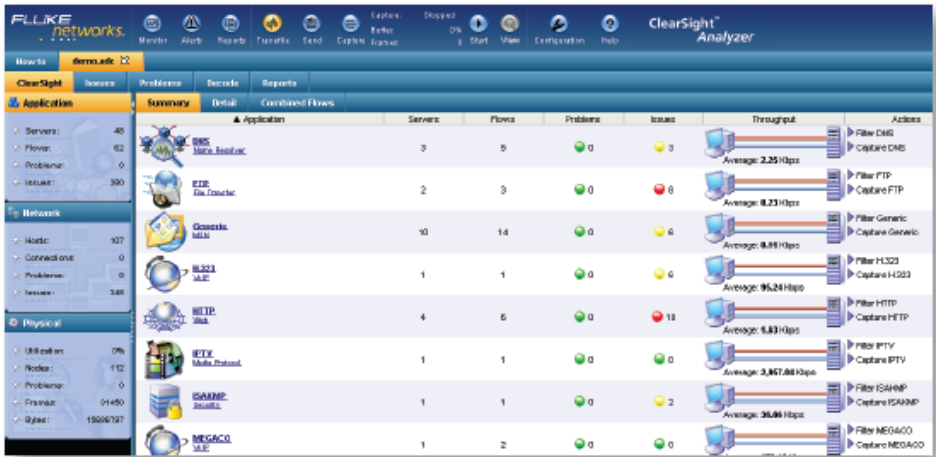
US 8631331 – Claim 15 vs. Fluke Network's Visual TruView

Claim	Visual TruView
15. A method of benchmarking network traffic classifications, comprising receiving network traffic trace data; converting the network traffic trace data into formats suitable for each of a plurality of classification plug-ins; executing the plurality of classification plug-ins in connection with the network traffic trace data; **evaluating classification results from each of the plurality of the classification plug-ins;** calculating a set of performance metrics including overall accuracy, precision, recall and F-measure based on the classification results; and storing the set of performance metrics in a database.	**Comprehensive Traffic Report** CSA provides a large inventory of standard reports in chart and table formats showing statistics and performance for network traffic, servers, and applications. CSA generates reports from real-time data or trace files. See QoS reports for voice and video traffic, showing statistics such as jitter, latency, packet loss, MOS, J-MOS, R-value, and video quality factor. Elements of these reports can be easily combined to produce custom reports.  **Researcher's Comment:** ClearSight Analyser generates complete statistics and performance reports for each application Source: http://www.flukenetworks.com/findit/en-us/3780533

US 8631331 – Claim 15 vs. Fluke Network's Visual TruView

Claim	Visual TruView
15. A method of benchmarking network traffic classifications, comprising receiving network traffic trace data; converting the network traffic trace data into formats suitable for each of a plurality of classification plug-ins; executing the plurality of classification plug-ins in connection with the network traffic trace data; evaluating classification results from each of the plurality of the classification plug-ins; **calculating a set of performance metrics including overall accuracy, precision, recall and F-measure based on the classification results; and** storing the set of performance metrics in a database.	The advanced MPLS package provides Service Level Agreements from site to site within an MPLS connectionless, any-to-any network. These metrics validate whether the service provider is meeting their network SLAs across the WAN from any location with the advanced MPLS package. The metrics with real time performance monitoring SNMP pro-active events include: • Availability per Class of Service from site to site • Packet Delivery Ratio as defined by actual customer traffic, not synthetic traffic • Round Trip Delay per Class of Service **Researcher's Comment:** Visual TruView calculates the performance metrics for the application performance problems/issues. Source: http://www.flukenetworks.com/content/datasheet-visual-performance-manager-and-truview-advanced-mpls-package-sku-01654

US 8631331 – Claim 15 vs. Fluke Network's Visual TruView

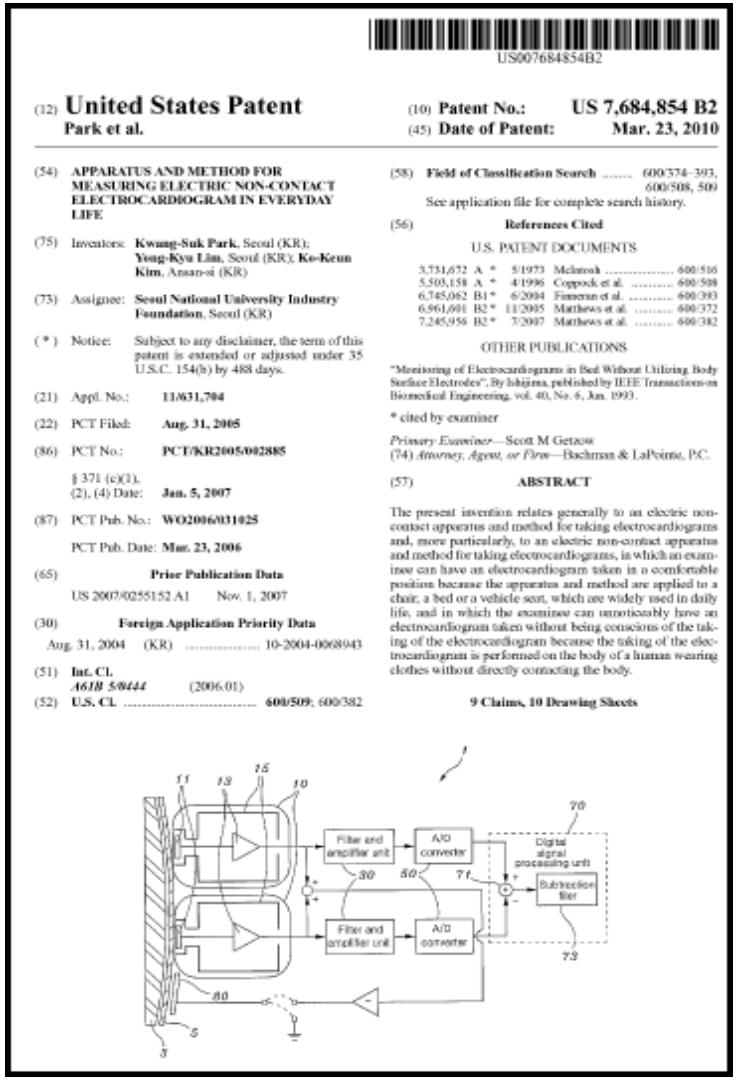
Claim	Visual TruView
15. A method of benchmarking network traffic classifications, comprising receiving network traffic trace data; converting the network traffic trace data into formats suitable for each of a plurality of classification plug-ins; executing the plurality of classification plug-ins in connection with the network traffic trace data; evaluating classification results from each of the plurality of the classification plug-ins; calculating a set of performance metrics including overall accuracy, precision, recall and F-measure based on the classification results; and **storing the set of performance metrics in a database.**	TruView passively monitors application transactions as they occur and reports response time for user, network and application tiers. Transaction details and summary information is stored in the appliance database where detail and summary information can be leveraged for troubleshooting, baselining, error detection, performance and availability analysis, trend reporting, and many other functions. Self-learning baselines allow you to see what typical performance is vs. current performance providing quick validation of performance degradation. Automated application discovery facilitates quick turn up and assurance of system configuration accuracy for monitoring all applications over the long haul. **Watch the video – Identify Application Issue.**

Researcher's Comment: Visual TruView stores the statistic reports and transaction details in database which can be used for future reference.

Source: http://www.flukenetworks.com/content/visual-truview-application-performance

ICEBERG CAPITAL PARTNERS

US 7684854 – Bibliographic information



US007684854B2

(12) **United States Patent**
Park et al.

(10) **Patent No.: US 7,684,854 B2**
(45) **Date of Patent: Mar. 23, 2010**

(54) **APPARATUS AND METHOD FOR MEASURING ELECTRIC NON-CONTACT ELECTROCARDIOGRAM IN EVERYDAY LIFE**

(75) Inventors: **Kwang-Suk Park**, Seoul (KR); **Yong-Kyu Lim**, Seoul (KR); **Ko-Keun Kim**, Ansan-si (KR)

(73) Assignee: **Seoul National University Industry Foundation**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 488 days.

(21) Appl. No.: **11/631,704**

(22) PCT Filed: **Aug. 31, 2005**

(86) PCT No.: **PCT/KR2005/002885**

§ 371 (c)(1),
(2), (4) Date: **Jan. 5, 2007**

(87) PCT Pub. No.: **WO2006/031025**

PCT Pub. Date: **Mar. 23, 2006**

(65) **Prior Publication Data**

US 2007/0255152 A1 Nov. 1, 2007

(30) **Foreign Application Priority Data**

Aug. 31, 2004 (KR) 10-2004-0068943

(51) **Int. Cl.**
A61B 5/0444 (2006.01)

(52) **U.S. Cl.** **600/509**; 600/382

(58) **Field of Classification Search** 600/374–393, 600/508, 509
See application file for complete search history.

(56) **References Cited**

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7,245,956	B2 *	7/2007	Matthews et al.	600/382

OTHER PUBLICATIONS

"Monitoring of Electrocardiograms in Bed Without Utilizing Body Surface Electrodes", By Ishijima, published by IEEE Transactions on Biomedical Engineering, vol. 40, No. 6, Jun. 1993.

* cited by examiner

Primary Examiner—Scott M Getzow
(74) *Attorney, Agent, or Firm*—Bachman & LaPointe, P.C.

(57) **ABSTRACT**

The present invention relates generally to an electric non-contact apparatus and method for taking electrocardiograms and, more particularly, to an electric non-contact apparatus and method for taking electrocardiograms, in which an examinee can have an electrocardiogram taken in a comfortable position because the apparatus and method are applied to a chair, a bed or a vehicle seat, which are widely used in daily life, and in which the examinee can unnoticeably have an electrocardiogram taken without being conscious of the taking of the electrocardiogram because the taking of the electrocardiogram is performed on the body of a human wearing clothes without directly contacting the body.

9 Claims, 10 Drawing Sheets

Patent of Interest:

US7684854
(Priority date: Aug 31, 2004)

Apparatus and method for measuring electric non-contact electrocardiogram in everyday life

Exemplary Market Applications:

Technology disclosed have applications in the following sectors:

- In medical field, taking ECG for diagnosis of heart disease, with examinee being in a chair, a bed or a vehicle seat (i.e. in comfortable position).
- Examiners/Doctors can take ECG without any direct contact to human body and without removing clothes (i.e. unnoticeable to examinee)
- Also, for gesture recognition signals in sports instruments, toys, electric appliances, smart lighting, gaming, and security.

ICEBERG CAPITAL PARTNERS

US 7684854 – Claim 1

1. An apparatus for taking Electrocardiograms (ECGs), the apparatus being attached to a human body, comprising:

one or more amplifier-attached electrodes (10) installed adjacent to appropriate locations of clothes (5) without directly contacting a body (3);

one or more filter and amplifier units (30) connected to first sides of the amplifier-attached electrodes (10) and configured to filter out external noise and amplify filtered signals;

one or more Analog/Digital (A/D) converters (50) connected to first sides of the filter and amplifier units (30);

a digital signal processing unit (70) provided to first sides of the A/D converter (50) and configured to transmit a taken ECG to a display and a post-processing device and the digital signal processing unit (70) comprises a subtractor (71) for obtaining a difference between the digitized biosignals input through the A/D converters (50), and a subtraction filter (73) for filtering out noise, which is generated during the subtraction, from the digital signals input through the subtractor (71); and

a ground plate (80) installed adjacent to an appropriate location on the clothes (5) without directly contacting the body (3).

US 7684854 – EoU Summary

Saelig's EPIC Vehicle Seat Sensor	
Key claim(s)	1, 8, 9 (independent claims)
Mapped product	Chart has been made with respect to EPIC Vehicle Seat Sensor
Source	Product information available at: http://www.saelig.com/supplier/plessey/Non-contact%20ECG%20measurement%20using%20EPIC-article0911312P.pdf http://www.saelig.com/ADV/ADV001.htm http://www.saelig.com/pr/epic.html
Publication date	Not earlier than 2011
Details of product / company	Saelig Company, Inc. is a New York State corporation operating as a Sales and Marketing Agent and Distributor for more than 100 manufacturers from all over the world. Saelig supplies electronic products like USB and Logic analyzers, Waveform Generators, Digital Pattern Generators, DMMs, wireless and wired data-loggers, SPI/I2C controllers, Touch-Sense, Ethernet and USB ICs and modules, CANbus and motor control boards, Ethernet-serial/USB-serial/RS232-485 etc. EPIC Sensor for Non-contact ECG was announced by Saelig in 2012.

US 7684854 – Saelig's EPIC Vehicle Seat Sensor: Overview

The EPIC Sensor (Electric Potential Integrated Circuit) - a new, innovative game-changing disruptive electric field sensor. This completely new sensor technology measures electric field changes without requiring physical or resistive contact. As the EPIC sensor does not need line of sight, it can even detect movement through solid walls, and can also be used to replace, or as an adjunct to, passive infra-red (PIR) sensors in a variety of applications including security motion detectors. An array of EPIC electric potential sensors is built into a vehicle seat pad to enable manufacturers to evaluate this exciting new technology. The EPIC sensor array is concealed under a removable cover. Electrical artefact noise caused by movement is minimized by placing the sensors on the lower part of the seat back, away from the shoulders.

Source: http://www.saelig.com/ADV/ADV001.htm
http://www.saelig.com/pr/epic.html

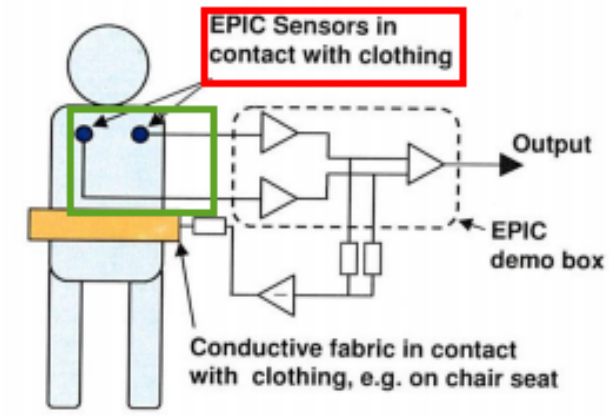
ICEBERG CAPITAL PARTNERS

US 7684854 - Claim 1 vs. Saelig's EPIC Vehicle Seat Sensor

Claim	EPIC Vehicle Seat Sensor
1. An apparatus for taking ElectroCardioGrams (ECGs), the apparatus being attached to a human body, comprising: one or more amplifier-attached electrodes (10) installed adjacent to appropriate locations of clothes (5) without directly contacting a body (3); one or more filter and amplifier units (30) connected to first sides of the amplifier-attached electrodes (10) and configured to filter out external noise and amplify filtered signals; one or more Analog/Digital (A/D) converters (50) connected to first sides of the filter and amplifier units (30); CONTINUED…	**Non-contact ECG measurement using EPIC Sensors** *Measuring electrocardiogram (ECG) signals without skin contact is possible using novel Electric Potential Integrated Circuit (EPIC) sensors.* **EPIC** sensors can be used to measure ECG signals without physical skin contact. While sensors can be embedded in a chair or seat, the techniques are equally applicable to sensors mounted on a mattress, in clothing or in other situations. **Researcher's Comment:** Epic Sensor provides a method for measuring the ECG for human body, without contacting the skin, with the sensors and rest being attached close to body i.e. to a chair or seat. Source: http://www.saelig.com/supplier/plessey/Non-contact%20ECG%20measurement%20using%20EPIC-article0911312P.pdf

ICEBERG CAPITAL PARTNERS

US 7684854 - Claim 1 vs. Saelig's EPIC Vehicle Seat Sensor

Claim	EPIC Vehicle Seat Sensor
1. An apparatus for taking ElectroCardioGrams (ECGs), the apparatus being attached to a human body, comprising: **one or more amplifier-attached electrodes (10) installed adjacent to appropriate locations of clothes (5) without directly contacting a body (3);** one or more filter and amplifier units (30) connected to first sides of the amplifier-attached electrodes (10) and configured to filter out external noise and amplify filtered signals; one or more Analog/Digital (A/D) converters (50) connected to first sides of the filter and amplifier units (30); CONTINUED…	Capacitive (insulated) electrodes can register ECG signals without conductive contact to the body - even through clothes - and represent an attractive alternative for a wide range of new applications. **EPIC** (Electric Potential Integrated Circuit) is a completely new sensor technology resulting from research at the University of Sussex (UK). Novel, ultra high impedance EPIC sensors measure electric field changes without requiring physical or resistive contact. This award winning, patent-protected sensor can rapidly measure electric potential sources such as electrophysiological signals or even spatial electric fields. It therefore has the ability to measure ECGs without direct skin contact. By adjusting the DSP and amplification circuitry, the sensors can be tuned for detection at a distance as required for differing automotive applications. **EPIC** sensor electrodes can be easily and discretely incorporated inside car seat backs to acquire the necessary biometric data.  *Figure 1 – Basic configuration for non-contact ECG measurement including capacitively-coupled DR" circuit.* **Researcher's Comment:** Here, sensor electrodes are placed in car seat backs such that its not in direct contact with human skin. Also, electrodes output are given to EPIC demo box where it reduces noise and give proper signal level. Source: http://www.saelig.com/supplier/plessey/Non-contact%20ECG%20measurement%20using%20EPIC-article0911312P.pdf

ICEBERG CAPITAL PARTNERS

US 7684854 - Claim 1 vs. Saelig's EPIC Vehicle Seat Sensor

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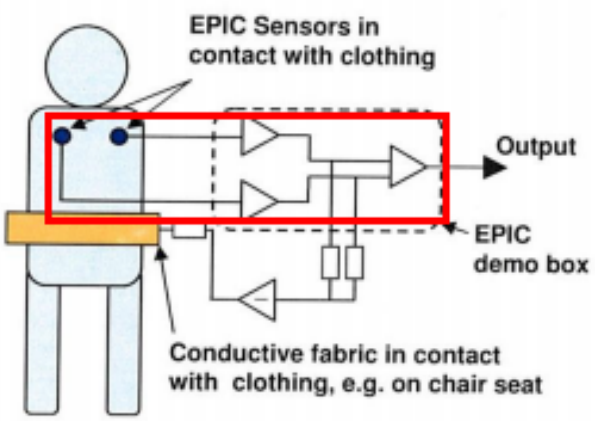
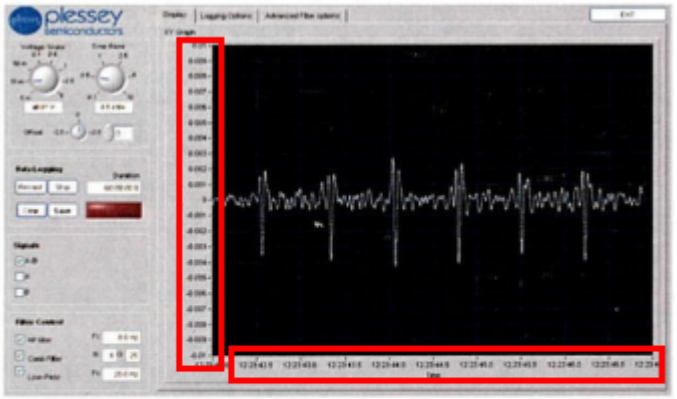
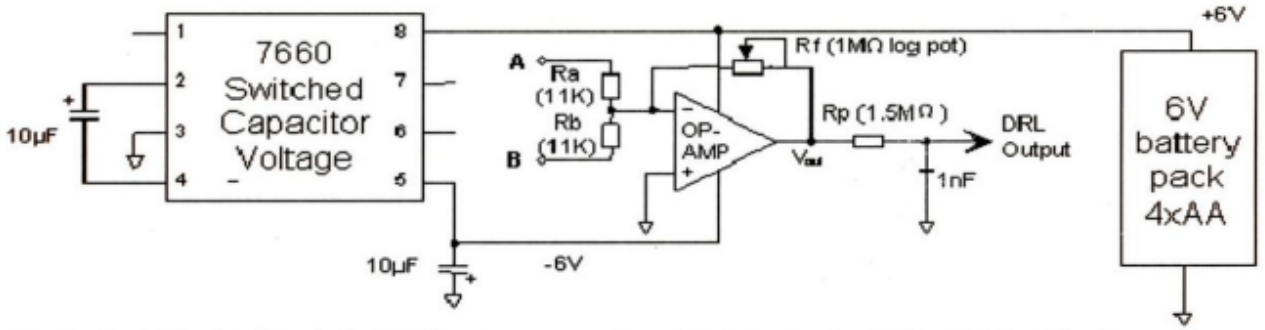
1. An apparatus for taking ElectroCardioGrams (ECGs), the apparatus being attached to a human body, comprising: one or more amplifier-attached electrodes (10) installed adjacent to appropriate locations of clothes (5) without directly contacting a body (3); **one or more filter and amplifier units (30) connected to first sides of the amplifier-attached electrodes (10) and configured to filter out external noise and amplify filtered signals;** one or more Analog/Digital (A/D) converters (50) connected to first sides of the filter and amplifier units (30); CONTINUED…	**Demo box settings** • Low Pass filter: ON • Gain : x10 for x10 gain sensors x1 for x50 gain sensors • Notch filter (50/60Hz): ON **Software settings** • Voltage scale: 10mV or 50mV • Time base: 0.5s/div • HP filter: Selected, 8Hz ** • Comb filter: Selected, N=6, Q=25 • LP filter: Selected, 25Hz **  *Figure 1 – Basic configuration for non-contact ECG measurement including capacitively-coupled DR" circuit.* **Researcher's Comment:** This represents that the Demo Box, which is in connection with sensor electrodes from car seat, already contains multiple filters and sensors for noise reduction and getting proper signal level. Source: http://www.saelig.com/supplier/plessey/Non-contact%20ECG%20measurement%20using%20EPIC-article0911312P.pdf

ICEBERG CAPITAL PARTNERS

US 7684854 - Claim 1 vs. Saelig's EPIC Vehicle Seat Sensor

Claim	EPIC Vehicle Seat Sensor
1. An apparatus for taking ElectroCardioGrams (ECGs), the apparatus being attached to a human body, comprising: one or more amplifier-attached electrodes (10) installed adjacent to appropriate locations of clothes (5) without directly contacting a body (3); one or more filter and amplifier units (30) connected to first sides of the amplifier-attached electrodes (10) and configured to filter out external noise and amplify filtered signals; **one or more Analog/Digital (A/D) converters (50) connected to first sides of the filter and amplifier units (30);** CONTINUED…	 *Figure 6 – ECG signals measured from a subject wearing a wool-mix sweater over a cotton shirt. Sensors attached to the chair-back were covered with an additional layer of cotton material. Filter settings limit the bandwidth to 8-25Hz. The heart rate can be easily extracted.* **Researcher's Comment:** Details about ADC is not explicitly disclosed here but we assume convertor is in there, as graph output is in terms of digital values. Thus, Analog heart beat signal is converted to digital representation as shown in figure Source: http://www.saelig.com/supplier/plessey/Non-contact%20ECG%20measurement%20using%20EPIC-article0911312P.pdf

US 7684854 - Claim 1 vs. Saelig's EPIC Vehicle Seat Sensor

Claim	EPIC Vehicle Seat Sensor
CONTINUED… **a digital signal processing unit (70) provided to first sides of the A/D converter (50)** and configured to transmit a taken ECG to a display and a post-processing device and **the digital signal processing unit (70) comprises a subtractor (71) for obtaining a difference between the digitized biosignals input through the A/D converters (50), and a substraction filter (73) for filtering out noise, which is generated during the subtraction, from the digital signals input through the subtractor (71); and** a ground plate (80) installed adjacent to an appropriate location on the clothes (5) without directly contacting the body (3).	**Implementation** The demonstration of non-contact ECG is best performed using an EPIC demonstration kit, Plessey part no. PS25003, which includes the necessary drive circuitry and switchable 50Hz and 60Hz notch filters. The inputs to the DRL circuit can be taken from the BNC outputs "A & B" on the front of the demo box. The DRL circuit will require its own bipolar power supply: ±5V or ±6V is suggested. A circuit design including a battery power supply is shown in **Figure 3.**  between the subject's body and the system ground. Some other method of reducing the power line noise is therefore required to enable the ECG signal to be extracted reliably and accurately. One such method utilizes an approach very similar to the "Driven Right Leg" (DRL) system that is used for the same purpose in conventional ECG measurement techniques. In conventional ECG the DRL signal is coupled directly to the patient's skin. The DRL signal reduces power line noise on the sensor signals by feeding back an inverted average of the signals from two sensors on to the patient's body. In non-contact ECG, the generated DRL signal can be capacitively-coupled to the body through clothing, via a piece of conductive Source: http://www.saelig.com/supplier/plessey/Non-contact%20ECG%20measurement%20using%20EPIC-article0911312P.pdf

ICEBERG CAPITAL PARTNERS

US 7684854 - Claim 1 vs. Saelig's EPIC Vehicle Seat Sensor

Claim	EPIC Vehicle Seat Sensor
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US 7684854 - Claim 1 vs. Saelig's EPIC Vehicle Seat Sensor

Claim	EPIC Vehicle Seat Sensor

CONTINUED…

a digital signal processing unit (70) provided to first sides of the A/D converter (50) **and configured to transmit a taken ECG to a display and a post-processing device** and the digital signal processing unit (70) comprises a subtractor (71) for obtaining a difference between the digitized biosignals input through the A/D converters (50), and a substraction filter (73) for filtering out noise, which is generated during the subtraction, from the digital signals input through the subtractor (71); and

a ground plate (80) installed adjacent to an appropriate location on the clothes (5) without directly contacting the body (3).

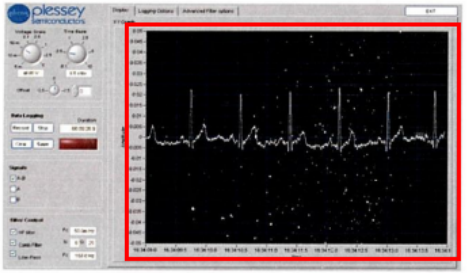

Figure 4 – Non-contact ECG signals measured through a single layer of cotton clothing, with a capacitively coupled DRL circuit. HP filter corner frequency is 50mHz, LP filter in demo box has corner frequency of 30Hz.

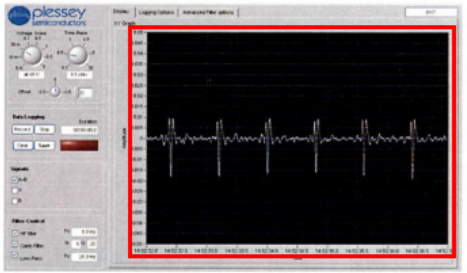

Figure 5 – Non-contact ECG signals measured through a single layer of cotton clothing, with a capacitively coupled DRL circuit. Software filters limit the bandwidth to 8-25Hz.

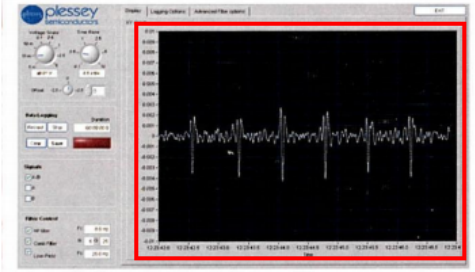

Figure 6 – ECG signals measured from a subject wearing a wool-mix sweater over a cotton shirt. Sensors attached to the chair-back were covered with an additional layer of cotton material. Filter settings limit the bandwidth to 8-25Hz. The heart rate can be easily extracted.

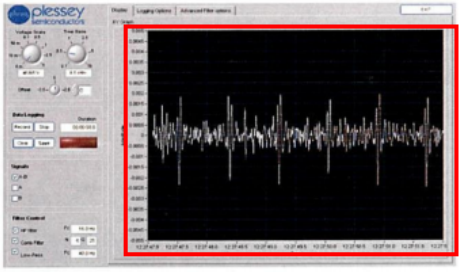

Figure 7 – ECG signals measured from a subject wearing a polyester fleece over a cotton shirt. Sensors attached to the chair-back were covered with an additional layer of cotton material. Filter settings limit the bandwidth to 16-40Hz. The heart rate can be easily extracted.

Researcher's Comment: ECG signal for heart rate are displayed in form of graphs on screen for different type of clothes

Source:
http://www.saelig.com/supplier/plessey/Non-contact%20ECG%20measurement%20using%20EPIC-article0911312P.pdf

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US 7684854 - Claim 1 vs. Saelig's EPIC Vehicle Seat Sensor

Claim	EPIC Vehicle Seat Sensor
CONTINUED… a digital signal processing unit (70) provided to first sides of the A/D converter (50) and configured to transmit a taken ECG to a display and a post-processing device and the digital signal processing unit (70) comprises a subtractor (71) for obtaining a difference between the digitized biosignals input through the A/D converters (50), and a substraction filter (73) for filtering out noise, which is generated during the subtraction, from the digital signals input through the subtractor (71); and **a ground plate (80) installed adjacent to an appropriate location on the clothes (5) without directly contacting the body (3).**	the much larger noise signals. EPIC sensors can be used in "contact mode" for ECG measurement, where the subject touches both the capacitive electrode surface and some metal at the system ground directly with the skin. This ground reference allows filtering and differential amplification of signals from two sensors to be effective in removing the mains frequency noise, leaving a high quality ECG signal. In non-contact ECG measurement there is – by definition - no skin contact, and thus no direct connection can be made between the subject's body and the system ground. Some other method of reducing the power line noise is therefore required to enable the ECG signal to be extracted reliably and accurately. One such method The Plessey EPIC Vehicle Evaluation Kit includes: a seat pad containing a six EPIC sensor array on the back portion and a ground plane on the base, an interface box with a USB output to a PC, USB cable, and software for display and recording. **Researcher's Comment:** Here ground plate is installed on base while sensors are on back. Also, there is no direct connection between subject's body and ground. Source: http://www.saelig.com/supplier/plessey/Non-contact%20ECG%20measurement%20using%20EPIC-article0911312P.pdf http://www.saelig.com/ADV/ADV001.htm

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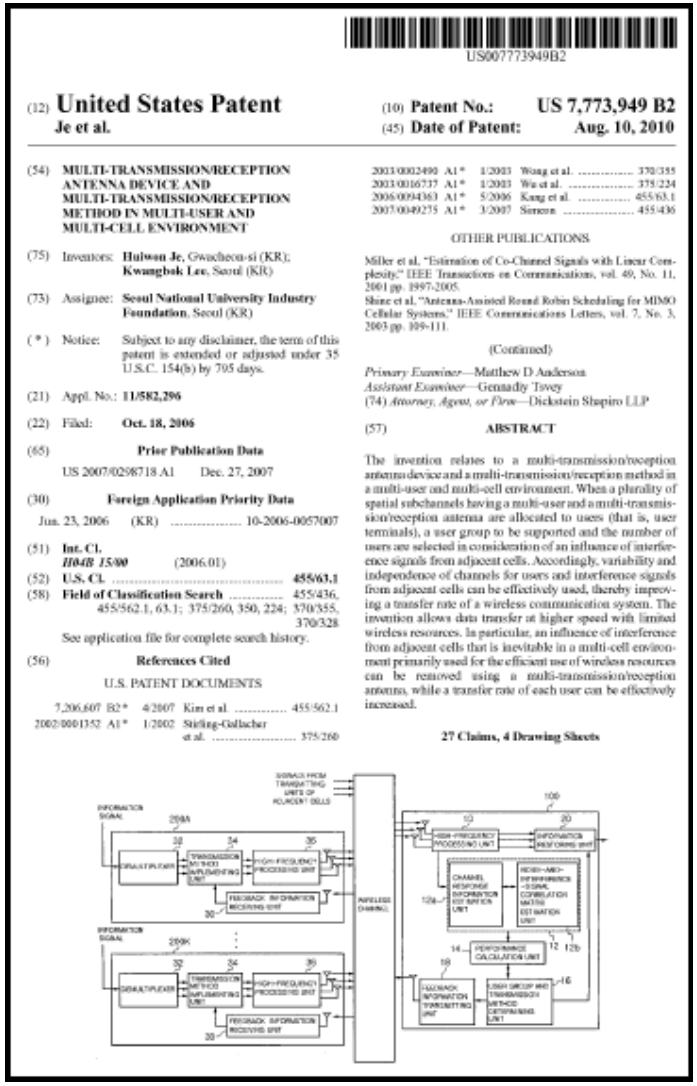
US 7773949 – Bibliographic information



US007773949B2

(12) **United States Patent**
Je et al.

(10) **Patent No.: US 7,773,949 B2**
(45) **Date of Patent: Aug. 10, 2010**

(54) **MULTI-TRANSMISSION/RECEPTION ANTENNA DEVICE AND MULTI-TRANSMISSION/RECEPTION METHOD IN MULTI-USER AND MULTI-CELL ENVIRONMENT**

(75) Inventors: **Hui won Je**, Gwacheon-si (KR); **Kwangbok Lee**, Seoul (KR)

(73) Assignee: **Seoul National University Industry Foundation**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 705 days.

(21) Appl. No.: **11/582,296**

(22) Filed: **Oct. 18, 2006**

(65) **Prior Publication Data**

US 2007/0298718 A1 Dec. 27, 2007

(30) **Foreign Application Priority Data**

Jun. 23, 2006 (KR) 10-2006-0057007

(51) **Int. Cl.**
H04B 15/00 (2006.01)

(52) **U.S. Cl.** **455/63.1**

(58) **Field of Classification Search** 455/436, 455/562.1, 63.1; 375/260, 350, 224; 370/355, 370/328

See application file for complete search history.

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(Continued)

Primary Examiner—Matthew D Anderson
Assistant Examiner—Gennadiy Tsvey
(74) *Attorney, Agent, or Firm*—Dickstein Shapiro LLP

(57) **ABSTRACT**

The invention relates to a multi-transmission/reception antenna device and a multi-transmission/reception method in a multi-user and multi-cell environment. When a plurality of spatial subchannels having a multi-user and a multi-transmission/reception antenna are allocated to users (that is, user terminals), a user group to be supported and the number of users are selected in consideration of an influence of interference signals from adjacent cells. Accordingly, variability and independence of channels for users and interference signals from adjacent cells can be effectively used, thereby improving a transfer rate of a wireless communication system. The invention allows data transfer at higher speed with limited wireless resources. In particular, an influence of interference from adjacent cells that is inevitable in a multi-cell environment primarily used for the efficient use of wireless resources can be removed using a multi-transmission/reception antenna, while a transfer rate of each user can be effectively increased.

27 Claims, 4 Drawing Sheets

Patent of Interest:

US7773949
(Priority date: Jun 23, 2006)

Multi-transmission/reception antenna device and multi-transmission/reception method in multi-user and multi-cell environment

Exemplary Market Applications:

Technology disclosed have applications in the following sectors:

- Used in LTE-Advanced(4G), to increase the efficiency and data transfer rate.
- In Multi-Cell environment, to decrease the interference from adjacent Cells.
- In mobile communication, to improve call quality by reducing noise.

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US 7773949 – Claim 9

9. A multi-transmission/reception method applied to a multi-transmission/reception antenna device in a multi-user and multi-cell environment that, for each cell, includes a plurality of first units each having a predetermined antenna, and a second unit in wireless communication with the plurality of first units, the method comprising:

(a) causing the second unit to estimate channel information on signals from the individual first units and information of noise and interference signals from adjacent cells;

(b) causing the second unit to calculate the sum of transfer rates for each user group having at least one first unit using the estimated information;

(c) causing the second unit to determine one user group by comparing the calculated sum of the transfer rates of each user group; and

(d) causing the second unit to feedback information on the determined user group to the first units of a corresponding cell,

wherein step (a) includes estimating the channel information from prescribed pilot signals received from the first units of the corresponding cell, calculating the noise and interference signals from adjacent cells by subtracting the estimated channel information from an arbitrarily received signal, and estimating the correlation matrix of the noise and interference signals by correlating them for a predetermined time.

US 7773949 – EoU Summary

3GPP CoMP for LTE-Advanced(Rel. 11)	
Key claim(s)	1, 9, 18, 23 (independent claims)
Mapped product	Chart has been made with respect to CoMP for LTE-Advanced(Rel. 11) The required details are available at: http://www.qtc.jp/3GPP/Specs/36819-b10.pdf
Source	Product information available at: http://www.qtc.jp/3GPP/Specs/36819-b10.pdf http://www.3gpp.org/technologies/keywords-acronyms/97-lte-advanced
Publication date	Not earlier than 2011
Details of product / company	The 3rd Generation Partnership Project (3GPP) is a collaboration between groups of telecommunications associations, known as the Organizational Partners. 3GPP standardization encompasses Radio, Core Network and Service architecture. The 3rd Generation Partnership Project initiative eventually arose from a strategic initiative between Nortel Networks and AT&T Wireless in 1998. The seven 3GPP Organizational Partners from Asia, Europe and North America are ARIB, ATIS, CCSA, ETSI, TTA, TTC, TSDSI. 3GPP has released various versions of GSM and LTE, out of which LTE-Advanced(Rel. 11) is discussed here.

US 7773949 – 3GPP CoMP for LTE-Advanced(Rel. 11) : Overview

In 3GPP Release-11 (LTE-A), new features are disclosed:

- Advanced IP Interconnection of Services
- Service layer interconnection between national operators/carriers as well as third party application providers
- Heterogeneous networks (HetNet) improvements
- Coordinated Multi-Point operation (CoMP)
- In-device Co-existence (IDC).

The main reason to introduce CoMP is to improve network performance at cell edges. In CoMP a number of TX (transmit) points provide coordinated transmission in the DL, and a number of RX (receive) points provide coordinated reception in the UL. A TX/RX-point constitutes of a set of co-located TX/RX antennas providing coverage in the same sector.

Source: http://www.3gpp.org/technologies/keywords-acronyms/97-lte-advanced

US 7773949 – Claim 9 vs. 3GPP CoMP for LTE-Advanced

Claim	CoMP for LTE-Advanced(Rel. 11)

9. A multi-transmission/reception method applied to a multi-transmission/reception antenna device in a multi-user and multi-cell environment that, for each cell, includes a plurality of first units each having a predetermined antenna, and a second unit in wireless communication with the plurality of first units, the method comprising:

(a) causing the second unit to estimate channel information on signals from the individual first units and information of noise and interference signals from adjacent cells;

(b) causing the second unit to calculate the sum of transfer rates for each user group having at least one first unit using the estimated information;

(c) causing the second unit to determine one user group by comparing the calculated sum of the transfer rates of each user group; and

CONTINUE…

At the 3GPP TSG RAN #50 meeting, the Study Item description on "Coordinated Multi-Point Operation for LTE" was agreed for Release 11 [1]. Coordinated multi-point (CoMP) transmission and reception is considered for LTE-Advanced Rel. 11 as a tool to improve the coverage of high data rates, the cell-edge throughput, and also to increase system throughput. The study item aims at evaluating the performance benefits and the standardization impact of enhanced CoMP operation. The detailed objectives are as follows.

This clause considers issues relating to UE transmission of SRS in support of DL CoMP. UE transmission of SRS can be used for CSI estimation at multiple cells/points exploiting channel reciprocity. Enhanced SRS schemes may be considered for new scenarios and transmission mechanisms, including enhancement of multi-cell/point orthogonality, SRS capacity and SRS power control.

Number of antennas at transmission point	Macro and high Tx power RRH: 1, 2, 4, 8 (2 and 4 antennas are baseline for FDD, 2 and 8 antennas are baseline for TDD) Low power node: 1, 2, 4 (2 and 4 antennas are baseline). Values for combinations (number of antennas at macro node, number of antennas at low-power node) are (2, 2), (4, 4) for FDD, (2, 2), (8, 2) for TDD as baseline, (2, 4) for FDD, (4, 2) for TDD as optional
Number of antennas at UE	2, 4, with higher priority for 2 antennas.

Source: http://www.qtc.jp/3GPP/Specs/36819-b10.pdf

ICEBERG CAPITAL PARTNERS

US 7773949 – Claim 9 vs. 3GPP CoMP for LTE-Advanced

Claim	CoMP for LTE-Advanced(Rel. 11)
9. A multi-transmission/reception method applied to a multi-transmission/reception antenna device in a multi-user and multi-cell environment that, for each cell, includes a plurality of first units each having a predetermined antenna, and a second unit in wireless communication with the plurality of first units, the method comprising: (a) causing the second unit to estimate channel information on signals from the individual first units and information of noise and interference signals from adjacent cells; (b) causing the second unit to calculate the sum of transfer rates for each user group having at least one first unit using the estimated information; (c) causing the second unit to determine one user group by comparing the calculated sum of the transfer rates of each user group; and **CONTINUE…**	Each CoMP scheme may be categorized into one of the following categories. - Joint Processing (JP): Data for a UE is available at more than one point in the CoMP cooperating set (definition below) for a time-frequency resource • Joint Transmission (JT): Simultaneous data transmission from multiple points (part of or entire CoMP cooperating set) to a single UE or multiple UEs in a time-frequency resource - Data to a UE is simultaneously transmitted from *multiple* points, e.g. to (coherently or non-coherently) improve the received signal quality and/or data throughput **Researcher's Comment:** LTE-Advanced has CoMP feature in which multiple transmission and reception happens in cells. Each cell contains multiple users(UE-device) for which transmission is performed. Each UE has 1 or more antennas and multiple CoMP sets connected to them. Source: http://www.qtc.jp/3GPP/Specs/36819-b10.pdf

US 7773949 – Claim 9 vs. 3GPP CoMP for LTE-Advanced

Claim	CoMP for LTE-Advanced(Rel. 11)

9. A multi-transmission/reception method applied to a multi-transmission/reception antenna device in a multi-user and multi-cell environment that, for each cell, includes a plurality of first units each having a predetermined antenna, and a second unit in wireless communication with the plurality of first units, the method comprising:
(a) causing the second unit to estimate channel information on signals from the individual first units and information of noise and interference signals from adjacent cells;
(b) causing the second unit to calculate the sum of transfer rates for each user group having at least one first unit using the estimated information;
(c) causing the second unit to determine one user group by comparing the calculated sum of the transfer rates of each user group; and
CONTINUE…
	This clause considers issues relating to UE transmission of SRS in support of DL CoMP. UE transmission of SRS can be used for CSI estimation at multiple cells/points exploiting channel reciprocity. Enhanced SRS schemes may be considered for new scenarios and transmission mechanisms, including enhancement of multi-cell/point orthogonality, SRS capacity and SRS power control.
	
	This clause lists different forms of explicit feedback in support of DL CoMP. They are all characterized by having a channel part and a noise-and-interference part.
	
	Channel part:
	- For each point in the UE's measurement set that is reported in a given subframe, one or several channel properties are reported
	
	Noise-and interference part, e.g.,
	- Interference outside
	  • The points reported by the UE
	  • CoMP transmission points

Researcher's Comment: At CoMP, information for downlink is derived from SRS signal sent by UE(channel part) and Noise-Interference Part, for adjacent cell interference.

Source: http://www.qtc.jp/3GPP/Specs/36819-b10.pdf

US 7773949 – Claim 9 vs. 3GPP CoMP for LTE-Advanced

Claim	CoMP for LTE-Advanced(Rel. 11)
9. A multi-transmission/reception method applied to a multi-transmission/reception antenna device in a multi-user and multi-cell environment that, for each cell, includes a plurality of first units each having a predetermined antenna, and a second unit in wireless communication with the plurality of first units, the method comprising: (a) causing the second unit to estimate channel information on signals from the individual first units and information of noise and interference signals from adjacent cells; **(b) causing the second unit to calculate the sum of transfer rates for each user group having at least one first unit using the estimated information;** **(c) causing the second unit to determine one user group by comparing the calculated sum of the transfer rates of each user group;** and **CONTINUE…**	Part of features and procedures defined in Rel-10 specification related to carrier aggregation and resource-restricted measurements may be adapted for standardizing CoMP related downlink signalling, CSI measurement/feedback and CoMP set management in the specification. Researcher's Comment: In carrier aggregation, sum of transfer rates for each user group is calculated based on feedback information. Source: http://www.qtc.jp/3GPP/Specs/36819-b10.pdf

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Claim	CoMP for LTE-Advanced(Rel. 11)
CONTINUE… **(d) causing the second unit to feedback information on the determined user group to the first units of a corresponding cell,** wherein step (a) includes estimating the channel information from prescribed pilot signals received from the first units of the corresponding cell, calculating the noise and interference signals from adjacent cells by subtracting the estimated channel information from an arbitrarily received signal, and estimating the correlation matrix of the noise and interference signals by correlating them for a predetermined time.	CoMP measurement set: set of points about which channel state/statistical information related to their link to the UE is measured and/or reported as discussed in clause 5.2.2 • The UE reports may down-select points for which actual feedback information is transmitted **Researcher's Comment:** CoMP measurement set determines all the interference issue and reports it back to UE. Source: http://www.qtc.jp/3GPP/Specs/36819-b10.pdf

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Claim	CoMP for LTE-Advanced(Rel. 11)

CONTINUE…
 	
(d) causing the second unit to feedback information on the determined user group to the first units of a corresponding cell, **wherein step (a) includes estimating the channel information from prescribed pilot signals received from the first units of the corresponding cell, calculating the noise and interference signals from adjacent cells by subtracting the estimated channel information from an arbitrarily received signal, and estimating the correlation matrix of the noise and interference signals by correlating them for a predetermined time.**
	UE transmission of SRS can be used for CSI estimation at eNB exploiting channel reciprocity.
	
	Noise-and interference part, e.g.,
	- Interference outside
	  • The points reported by the UE
	  • CoMP transmission points
	- Total receive power (Io) or total received signal covariance matrix
	  • Covariance matrix of the noise-and-interference
	  • Full matrix, or
	  • Main eigen component(s)
	
	Researcher's Comment: CoMP sets estimates channel information(CSI) from the SRS-signal received from UE(first unit). It also calculates the outside/adjacent noise-interference and creates a corresponding covariance matrix of noise and interference values.
	
	Source: http://www.qtc.jp/3GPP/Specs/36819-b10.pdf

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