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R&D Trend Analysis of Wellbeing AI Using Panoramic View Analytics

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Abstract

This paper reveals the results of an analysis of R&D trends in Wellbeing & Healthcare AI using our unique visualization method – Panoramic View Analytics. This method, used for making R&D strategy, allowed us to extract the main areas of technology and areas of growth from massive amounts of patent data in the Wellbeing & Healthcare AI fields. Among them are robotics, sentimental analysis, telemedicine/home care, as well as medication systems.

Introduction

With artificial intelligence (AI) entering its 3rd major boom, R&D competitiveness has become fiercer and fiercer worldwide. With this reemerging interest, several potentially concerning factors have arisen, such as social issues including a rise in unemployment, ethical dilemmas related to the natural existence of humans, and many more. From this point on, it is important for R&D efforts to focus on producing AI technologies that can contribute to a *human-centric* design.

In this paper, to better understand the R&D trends of Wellbeing AI, we used panoramic view analytics to analyze a massive amount of technology information, such as patents and research papers (Nakamura 2015). In doing this, not only did major technology areas become clearly recognizable, but so did fusion fields among AI and technology for increasing wellbeing, major players in this space, technology trends, emerging and growing areas, white space, and more. We will focus on showing the main technology fields, growing and fusion fields, as well as the effectiveness of panoramic view analytics.

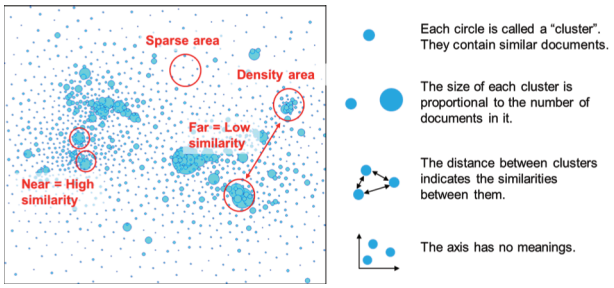

Figure 1: Understanding the Radar Chart.

Methodology

Panoramic View Analytics

Panoramic view analytics is our unique data visualization method of massive amounts of document data. This method represents a similarity among documents as distance, and displays them in a two-dimensional radar chart. It produces highly accurate analyses because of two unique factors: 1) similarity evaluation using high-dimensional data representation, and 2) an amplifying data visualization algorithm for the multi-dimensional scaling method of analyzing technological information.

Figure 1 shows how to understand the radar chart. We can get insights by analyzing information on the radar chart such as distance, density, white space and distribution. Thus, through this data mining method, we provide various major Japanese companies with R&D strategy consultation including R&D trend analysis, SWOT analysis, detection of white space, discovery of burgeoning and growing areas, creation of alliance strategies, etc. (Faggella 2016).

Dataset of Analysis

Initially, we searched US applications published between 2001 and Oct. 26, 2016. In this paper, we will refer to pub-

lished applications as 'patents' for simplicity. With regards to patents on wellbeing / healthcare, we gathered about 7,000 patents through a keyword search against title, abstract and claims. The keywords were "well(-)being", "happy", "happiness" and "healthcare". On the other hand, with regards to AI, we gathered about 14,000 patents by International Patent Classification (IPC) search "G06N". G06N is the IPC that represents the core technology area of AI (Computer systems based on specific computational models). This IPC is also used in JPO's report on AI (Japan Patent Office, 2015). Finally, we combined the two datasets (about 21,000 patents).

Results

Figure 2 shows the combined radar chart. Left and right side represent wellbeing / healthcare and AI, respectively. The main areas on left side are medical / prescription information management, risk management, monitoring and medical fraud detection. On the right side, the main technology areas are Q&A system, agent, ontology, inference, rule based, classification, robot, neural network and neuromorphic chip.

To understand the fusion areas among wellbeing / healthcare and AI, we searched for clusters that are a mix of both. Regarding clusters on the AI side, we extracted the clusters containing 50% to 80% G06N patents (list A). On the other hand, regarding clusters on the wellbeing / healthcare side, we extracted the clusters that contained 20% to 50% G06N patents (list B). Table 1 and 2 show examples of invention names included in the top 10 clusters (by volume) in each list. From the tables, we can understand that there are fusion areas with the following keywords: "robot", "connected car", "healthcare ontology", "medical fraud detection", "sentimental analysis", "telemedicine / home care", "medical information security", "medication management", "risk prediction", "patient condition analysis", "predicting drug-drug interactions" and "utilization of physiological data".

Furthermore, the growing areas are shown as blue squares in Figure 2. These are identified by the growth of the number of patents in each mesh. For example, in the AI area, "neural network", "neuromorphic chip" and "Q&A system" are detected as growing areas. On the other hand, in the fusion areas mentioned above, "robot (A1)", "sentimental analysis (A6)", "telemedicine / home care (A7)" and "medication management (B1)" are growing areas.

Conclusion

In this paper, to understand the R&D trends of wellbeing AI, we applied panoramic view analytics to massive amounts of patent data on wellbeing / healthcare and AI.

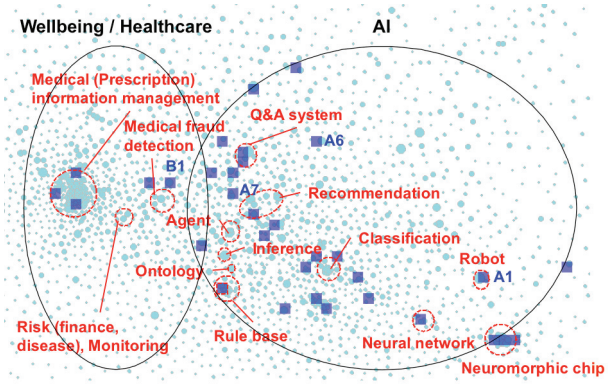

Figure 2: Radar chart of wellbeing / healthcare and AI.

Table 1: Fusion fields of list A.

No.	Publication no.	Title (example)
A1	20150273697	ROBOT FOR MEDICAL ASSISTANCE
A2	20160104486	Methods and Systems for Communicating Content to Connected Vehicle Users Based Detected Tone/Mood in Voice Input
A3	20070005621	Information system using healthcare ontology
A4	20120290516	Habituation-compensated predictor of affective response
A5	20140149128	HEALTHCARE FRAUD DETECTION WITH MACHINE LEARNING
A6	20120278064	SYSTEM AND METHOD FOR DETERMINING SENTIMENT FROM TEXT CONTENT
A7	20120215555	SYSTEMS AND METHODS FOR HEALTHCARE SERVICE DELIVERY LOCATION RELATIONSHIP MANAGEMENT
A8	20160156781	SECURELY AND EFFICIENTLY TRANSFERRING SENSITIVE INFORMATION VIA A TELEPHONE
A9	20060129427	Systems and methods for predicting healthcare related risk events
A10	20080294692	Synthetic Events For Real Time Patient Analysis

Table 2: Fusion fields of list B.

No.	Publication no.	Title (example)
B1	20100185456	Medication Management System
B2	20160156781	SECURELY AND EFFICIENTLY TRANSFERRING SENSITIVE INFORMATION VIA A TELEPHONE
B3	20150324693	PREDICTING DRUG-DRUG INTERACTIONS BASED ON CLINICAL SIDE EFFECTS
B4	20120190937	EMOTION SCRIPT GENERATING , EXPERIENCING , AND EMOTION INTERACTION
B5	20030050797	System and user interface for processing healthcare related event information
B6	20080164998	Location Sensitive Healthcare Task Management System
B7	20140108025	COLLECTING AND TRANSFERRING PHYSIOLOGICAL DATA
B8	20090248744	TRANSACTIONAL STORAGE SYSTEM FOR HEALTHCARE INFORMATION
B9	20100205001	SYSTEM AND METHOD FOR ASSISTING IN THE HOME TREATMENT OF A MEDICAL CONDITION
B10	20140249848	DEFINING PATIENT EPISODES BASED ON HEALTHCARE EVENTS

We were able to reveal that the fusion fields and growing areas are robotics, sentimental analysis, telemedicine / home care and medication management systems, etc. With this direction, researchers in any field can easily find trends and create R&D strategy through panoramic analytics. In the future, we will analyze scientific paper data on wellbeing AI.

References

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