

平成 30 年 6 月 15 日現在

機関番号：24403

研究種目：若手研究(B)

研究期間：2016～2017

課題番号：16K16089

研究課題名(和文) Document reading analysis - towards smart documents.

研究課題名(英文) Document reading analysis - towards smart documents

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交付決定額(研究期間全体)：(直接経費) 3,100,000円

研究成果の概要(和文)：The aim of this research project is to create smart documents that can adapt themselves to the readers. Some sensors such as eye trackers (Tobii, SMI, pupil, JINS MEME) and physiological sensors (E4 wristband) are used to analyze information about the user while reading a document.

研究成果の概要(英文)：The aim of this research project is to create smart documents that can adapt themselves to the readers. Some sensors such as eye trackers (Tobii, SMI, pupil, JINS MEME) and physiological sensors (E4 wristband) are used to analyze information about the user while reading a document. For example we estimate the reader comprehension, confusion, concentration and emotion. At the same time, the document that the reader is interacting with is analyzed. The information about the document and the user behavior are combined to proceed a "mutual analysis". By knowing the difficulty of a document and the skill of the reader, the system can select an easier version of the document. Another application is to recommend a user to review specific parts of a lesson based on the confidence and correctness of his answers.

研究分野：Computer science

キーワード：eye tracking reading analysis reading understanding smart documents

1 . 研究開始当初の背景

Reading is an important activity in our life. We acquire a large part of our knowledge by reading textbooks, newspapers, websites, etc. But no tools are available for monitoring, analyzing and giving a feedback about our daily-life reading. Our purpose is to enrich the readers and the documents by doing research about “document reading analysis”. The reading is recorded with an eye tracker, then mutual information about the readers and the documents is extracted. We quantify and qualify the reading behavior to provide a feedback about document difficulty and reader comprehension. We imagine smart document that can adapt itself to the reader in order to individualize the reading experience.

2 . 研究の目的

We introduced few years ago the “reading life-log” which aims to save the content of the texts we read. It is an important tool for getting information about the readers and the documents. In order to estimate the reader’s skill, we analyze his behavior while reading documents (such as his eye movement). We can also estimate the difficulty of a text, based on the behavior of different readers.

Our technology can also be used for annotating or rating documents

automatically based on the reading behavior. Several information can be very useful such as: “Which part of the document is never read, which part is often reread, which part is hard to understand, etc.” As a concrete application, the students can be advised to reread some parts of the lesson automatically, based on their reading behavior. On the other hand, the teachers can know which students have a problem to understand which parts, and the publisher can collect this information to improve the textbooks.

3 . 研究の方法

The final goal is to individualize the reading experience. We want to make interactive documents that can automatically evolve to make each reading a unique experience. Depending on the reader expertize, some simple or complex details can be displayed or hidden. When reading a book, if the reader tends to skip descriptive parts of a novel, they can be removed or summarized. If he struggles with some complex vocabulary, the text can be simplified. If important information is skipped, it can be integrated again, later in the text.

4 . 研究成果

During this research project multiple sensors such as eye

trackers (Tobii, SMI, pupil, JINS MEME) and physiological sensors (E4 wristband) have been used to analyze information about the user while reading a document: his comprehension, confusion, concentration and emotion.

At the same time the user is reading a document, an analysis of the document is also performed. The information about the document and the user behavior are then combined to proceed a "mutual analysis".

a) Reader's understanding

Thanks to this analysis we can predict which word is difficult to read for a non-native speaker to help him to learn new words. We succeed to predict the reader's English skill [1] and TOEIC score [2], the reader's subjective difficult words [3] (this is a joint research with Indian Statistical Institute), the Japanese reading understanding [4].

b) User's confidence

We also succeed to predict the user confidence while answering multiple choice questions [5] in order to recommend him to review the corresponding part of a lecture.

c) Reader's emotion

By analyzing physiological signals such as blood pressure, skin conductivity and skin temperature, we are able to analyze the reader's emotion and the type of document he is reading [6].

d) Vocabulary and recommender systems

Thanks to the reading life log we can analyze the reader's vocabulary. We build a website recommending the user to read text based on the text difficulty and the user's skill [7]. This is a joint research with the University of Bordeaux.

5 . 主な発表論文等

(研究代表者、研究分担者及び連携研究者には下線)

{ 雑誌論文 } (計 1 件)

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〔図書〕(計 件)

〔産業財産権〕

出願状況(計 件)

名称：
発明者：
権利者：
種類：
番号：
出願年月日：
国内外の別：

取得状況(計 件)

名称：
発明者：
権利者：
種類：
番号：
取得年月日：
国内外の別：

〔その他〕
ホームページ等

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