



Implementing a Gesture-based Annotation E-book System to Detect Learner's Reading Disfluency

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Outline

- Introduction
- Backgrounds
- E-Book System
- Gesture-Based Annotation
- Reading Disfluency
- Conclusions & Future Issues



Introduction

- The development of e-book not only changed the way of traditional publications, but also created a new revolutionary of knowledge dissemination.
- Researchers have paid more much focus on e-books, which have become an effective pedagogical tool for educators (Huang & Liang, 2014; Liang & Huang, 2014).



Introduction

- Several researchers thus have paid much more focus on developing and designing the user interface of e-book learning system (Liu, 2005).
- In other words, they attempted to modify the operations to improve usefulness of an e-book (Lim & Hew, 2014).



Introduction

- Huang, Liang, Su & Chen (2012) develop a personalized learning with an interactive e-book learning system to provide e-annotation and bookmarks, content searching, and learning process tracking, were designed to reinforce student learning.



Introduction

- To combine with the Internet and mobile technologies, an e-book system became not only a reading device but also an integrated learning environment.
- When learner reads an e-book, the use of the reading rate can reflect the reading behaviors and comprehension outcomes throughout the whole e-book reading process (Huang & Liang, 2014).



The Purposes of this Study

- However, the traditional text selection mechanism on touch screen is difficult to manipulate, which maybe lead to those un-accurate records (Brush, Barger, Gupta & Cadiz, 2001).
- Hence, it's necessary to provide a more convenient operation of annotation for reading on e-book system.



The Purpose of this Study

A Gesture-Based Annotation

Reading Rate & Readability

E-Book

Records

Behavior

Feedback



Records of Annotation

Teaching / Learning strategy



Highlight Strategy

- Improve reading comprehension (Shaughnessy & Baker, 1988).
- Widely adopted in our elementary school.



Reading Rate

Table 1. The reading rates and statuses associated with reading behaviors in the literature

Reading status	Reading rate (wpm)	Reading behavior	Study
On-reading	0-1,000		
<i>Slowing</i>	< 50	Excessively slow Inefficient reading Disfluent Labored Inexpressive Unenthusiastic rendering	(Harris & Sipay, 1990; Rasinski, 2000; Walczyk, Marsiglia, Bryan, & Naquin, 2001)
<i>Memorizing</i>	50-100	Sustained attention	(Carver, 1977, 1990; Duggan & Payne, 2009; Fraser, 2007; Gillett & Temple, 1986; Harris & Sipay, 1990; Z. M. Liu, 2005; Z. M. Liu & Huang, 2008; Rasinski, 1999; Reader & Payne, 2007; Reading, 2012; Stroud & Henderson, 1943)
<i>Learning</i>	100-200	In-depth reading Oral reading Concentrated reading Annotation (highlight)	
<i>Rauding</i>	200-400	Silent reading*	
<i>Skimming</i>	400-700	Keyword spotting One-time reading	
<i>Scanning</i>	700-1,000	Reading selectively Browsing and scanning Non-linear reading	
Off-reading	≥ 1,000		
<i>Flipping</i>	≥ 1,000	Flip page Glance and glimpse	(Carver, 1977, 1984; Harris & Sipay, 1990)

Note. “*” represents a reading behavior examined in this study.



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<i>Learning</i>	100-200	In-depth reading Oral reading Concentrated reading Annotation (highlight)	Rasinski, 1999; Reader & Payne, 2007; Reading, 2012; Stroud & Henderson, 1943)
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Readability

- Readability refers to the degree to which a text can be understood (Dale & Chall, 1949; Klare, 2000).
- Texts with high readability facilitate comprehension and learning efficiency, and hence, readability has been of long-standing research interest to reading psychologists and educational psychologists (Benjamin, 2012; Klare, 2000).



Feedback

- Learner's reading disfluency can be detected from this information and feedbacked to the teacher.
- Providing a personalized, adaptive, or interactive functions enhances learner's reading comprehension when reading disfluency.



E-Book System

- Screenshot of e-book system





E-Book System

- Screenshot of e-book system

A.S.H.E - 註記系統

攀岩好身手

趁著週末假期，熊爸翻出收藏的DVD《不可能的任務III》和阿弟共享。

一開場，阿湯哥攀在大峽谷上的畫面，讓阿弟讚嘆不已。

「爸，你說那叫什麼？」

「攀岩啊！」

「看起來好刺激，好像很好玩，真想試試。

但是，又擔心一不小心就會摔下來耶！」

「你年紀這麼小，又是初學者，



E-Book System

- Screenshot of e-book system



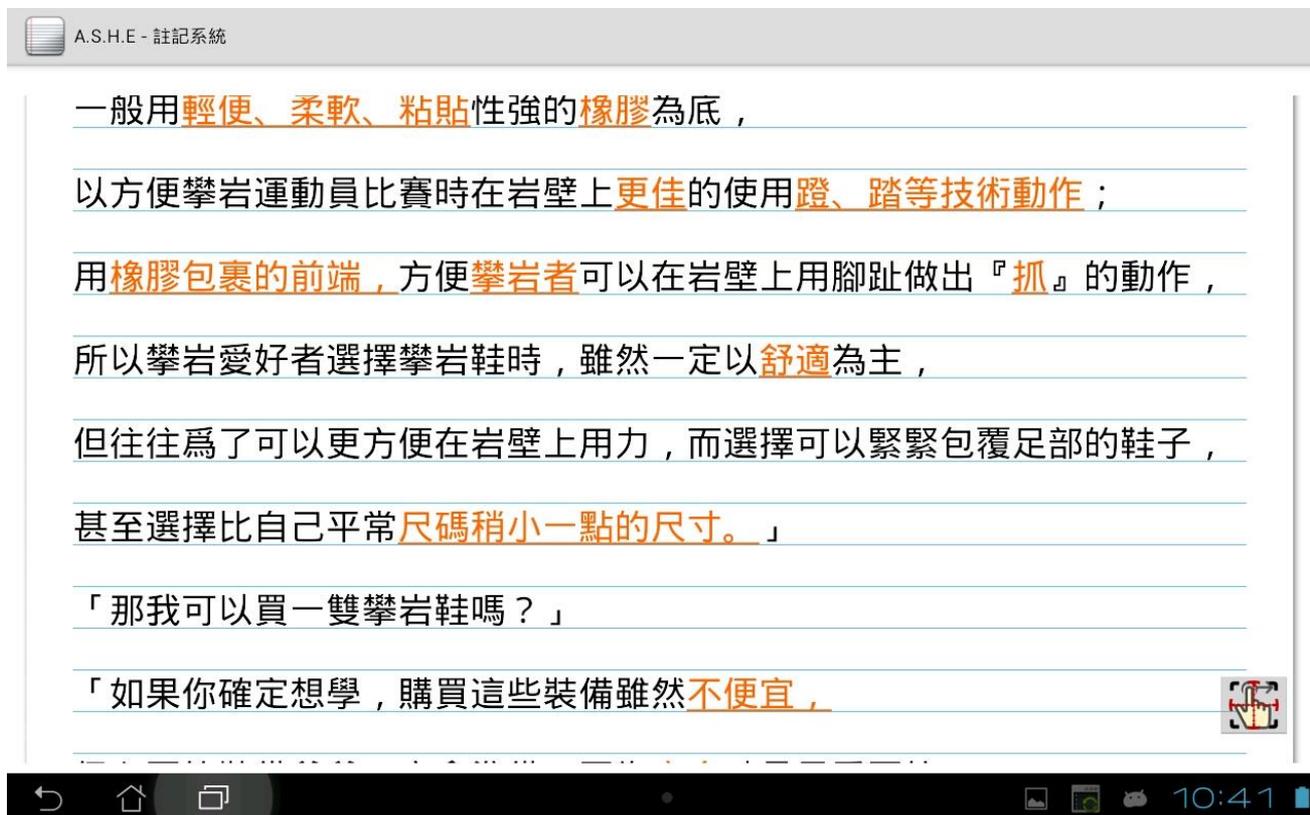


E-Book System

- Screenshot of e-book system

A.S.H.E - 註記系統

一般用輕便、柔軟、粘貼性強的橡膠為底，
以方便攀岩運動員比賽時在岩壁上更佳的使用蹬、踏等技術動作；
用橡膠包裹的前端，方便攀岩者可以在岩壁上用腳趾做出『抓』的動作，
所以攀岩愛好者選擇攀岩鞋時，雖然一定以舒適為主，
但往往為了可以更方便在岩壁上用力，而選擇可以緊緊包覆足部的鞋子，
甚至選擇比自己平常尺碼稍小一點的尺寸。」
「那我可以買一雙攀岩鞋嗎？」
「如果你確定想學，購買這些裝備雖然不便宜，





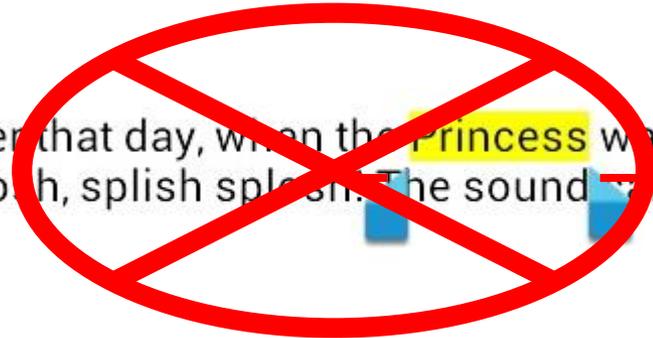
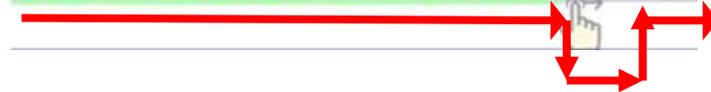
A Gesture-Based Annotation

- Animation schematic

他們倆現在仍然嚇得抖個不停。

月亮高掛在空中散發著柔和的光芒，

Later that day, when the Princess was sitting on the ground, she heard a splash, splish splash. The sound came from the pond.





Records of Annotation

台灣大哥大... 144K/s 晚上 11:36

401012014-.

Common

Start Word End Word Duration Reading Rate

	A	B	C	D	E	F
	第i行	共X字	費時秒	費時毫秒	平均速率(字/秒);	
2	1	12	46	19	0.26076185923205636;	
3	2	5	5	241	0.9540164090822363;	
4	3	28	13	201	2.1210514354973107;	
5	4	22	8	515	2.583675866118614;	
6	5	7	15	20	0.4660452729693742;	
7	6	3	10	978	0.27327382036800874;	
8	7	15	12	371	1.2125131355589684;	
9	8	15	17	969	0.8347709944905114;	
10	9	11	9	80	1.2114537444933922;	
11	10	10	10	235	1.9562251821040106;	

E-Book System

「你年紀這麼小，又是**初學者**，當然不會要你現在就去爬難度那麼高的**岩壁**。攀岩危險性高，但只要遵照**安全規則多加注意**，這項運動還算是**安全**。」

「萬一不小心掉下來怎麼辦？」

「有『**確保者**』啊，他會一直拉著繩子幫忙你。」

「原來會有確保者保護我的安全啊！**真讚**！」

攀岩場地

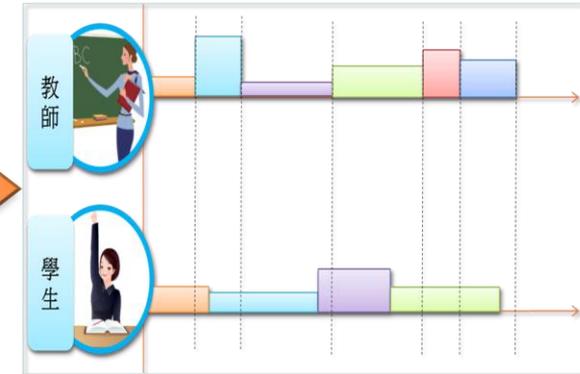
熊爸摸摸阿弟的頭，接著告訴阿弟，在臺灣**攀岩運動**越來越普及。

E-Book Reading



1	第1行	共X字	費時秒	費時毫秒	平均速率(字/秒):
2	1	12	46	190.26076185923205636;	
3	2	5	5	2410.9540164090622363;	
4	3	28	13	2012.1210514354973107;	
5	4	22	8	5152.583675866118614;	
6	5	7	15	200.4660452729693742;	
7	6	3	10	9780.27327382036800874;	
8	7	15	12	3711.2125131355589684;	
9	8	15	17	9690.834770944905114;	
10	9	11	9	801.2114537044933922;	
11	10	10	10	2251.85635103126106;	

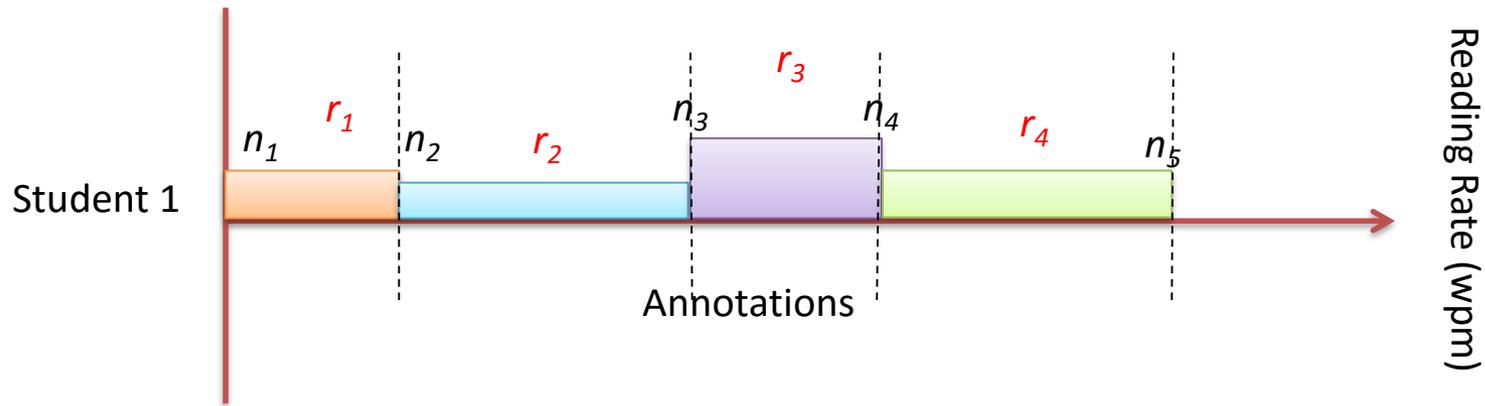
Annotation Records



Reading Rate



Reading Rate



$$r_1 = \frac{n_2 - n_1}{t_2 - t_1}$$



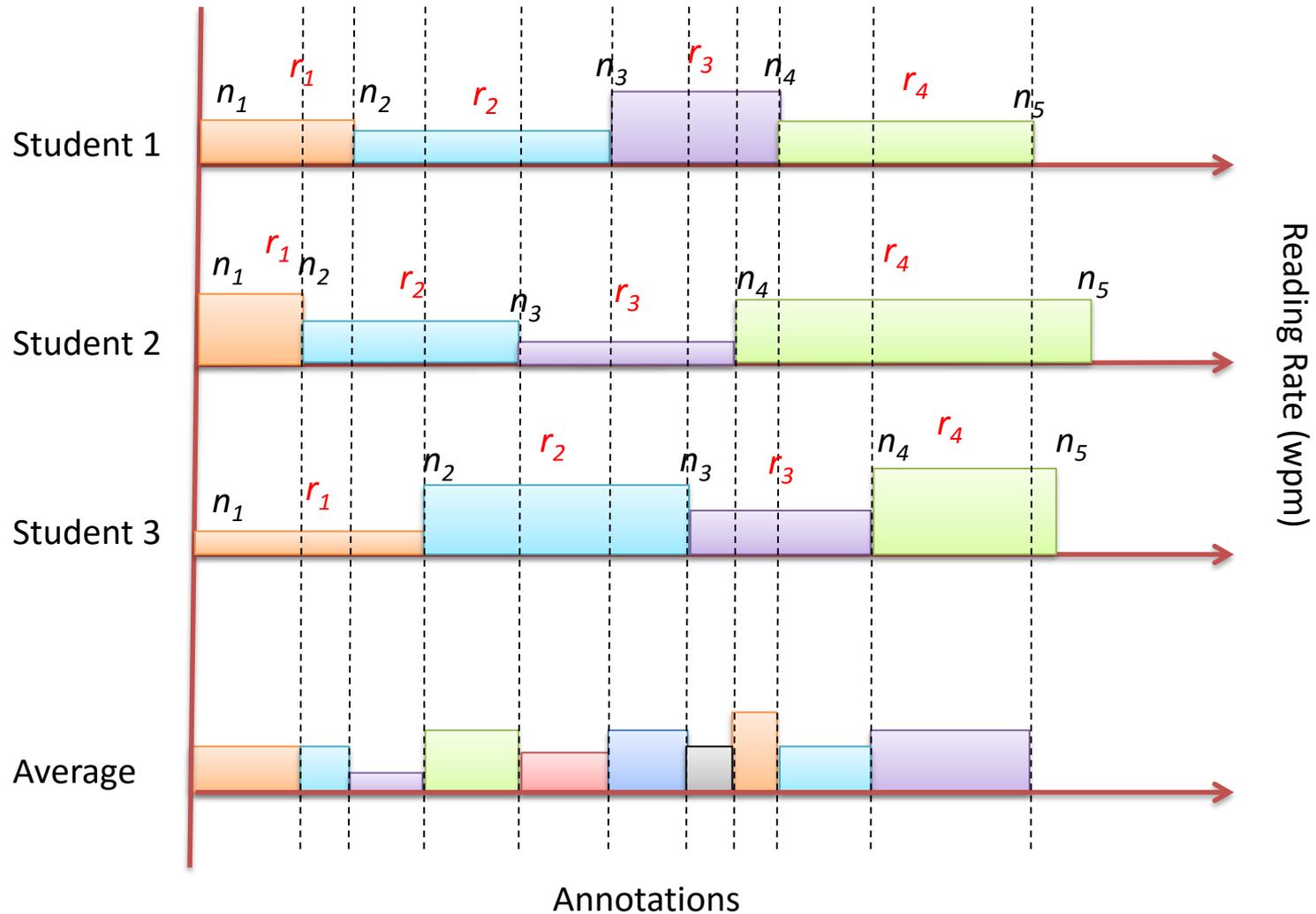
$$r_i = \frac{n_{i+1} - n_i}{t_{i+1} - t_i}$$

Reading Rate:

$$\bar{r} = \sum_{i=1}^{N-1} \frac{r_i \times (n_{i+1} - n_i)}{n_N - n_1}$$



Reading Disfluency





Reading Disfluency

- Average Reading Rate of a Word:

$$r_k^w = \frac{\sum_{j=1}^J r_{jk}}{J}$$

r_k^w : Average Reading Rate of Word k

r_{jk} : Reading Rate of Student j at Word k

- Average Reading Rate of an Interested Section:

$$\hat{r} = \frac{\sum_{k=m}^M r_k^w}{M - m + 1} \quad \text{where } 1 \leq m \leq k \leq M \leq K$$



Conclusion

- A gesture-based annotation e-book system provides more intuitive and direct to do annotations.
- The innovated mechanism of annotations that is much easier, faster, and more accurate than traditional text selection mechanism.



Conclusion

- Hence, this system could accurately record students' reading rate when they read e-books, and the readability analysis mechanisms also could effectively detect learner's reading disfluency.



Future Issues

- Reading rate analysis
- Efficiency of readability computing
- Highlight strategy vs. Learning anxiety
- Highlight strategy vs. Reading comprehension
- Highlight strategy vs. Reading performance
- Technology Acceptance Model



成功大學

National Cheng Kung University

Multimedia Network Laboratory

The End~

Thanks!

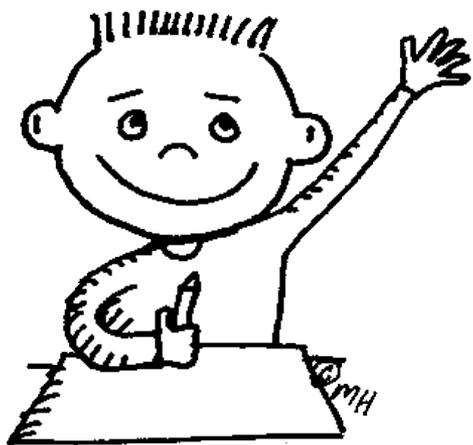
A simple black and white cartoon drawing of a smiling face with a hand raised, appearing to peek from behind the 'Thanks!' text.



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Q & A

