Analog Stick Hangeul Input Method Editor

Eru Hojin Kim (20021027)

School of Engineering, Information and Communications University
eruhkim .AT. icu.ac.kr

Abstract

Recently, market size of console is getting larger and larger. Functions of them are also variety, some device can access to the Network using Wi-Fi or BlueTooth. Therefore need for input method editor using analog stick, basic input device for console is produced. This paper introduces new analog stick Hangeul input method editor which is based on principles of invention of Hangeul, and experiment to with demo program.

1. Introduction

In May, 2005, Microsoft Corporation (MS) introduced Xbox 360™, Sony Computer Entertainment (SCE) introduced PlayStation® 3, the new generation of console. MS said that Xbox 360 is the future of entertainment, SCE also emphasis its ability to the development of PS3. Current generation of PlayStation, PlayStation® 2 is now being sold more than 70 million units, sales of Xbox™ is also more than 10 million units. Nowadays, console can be used as not only game machine but also network device using Wi-Fi, Ethernet, BlueTooth. Furthermore, portable console such as PlayStation Portable, Nintendo DS are introduced, people try to make portable console be do things as personal digital assistant – PIMS, address book, schedule.

Development of console makes needs of new input method editor for alphabet or Hangeul to input characters efficiently and effectively. But there is no special input device other than analog stick. Analog stick is a single, thumb-operated stick on a game-pad that provides precise. Recently research about analog stick input method editor for alphabet is one of hot issue on text entry. However there is no special research about Hangeul input method editor using analog stick.

This paper refers other alphabet IME and some different Hangeul IME using arrow keys, suggests new analog stick Hangeul IME and experiments it.

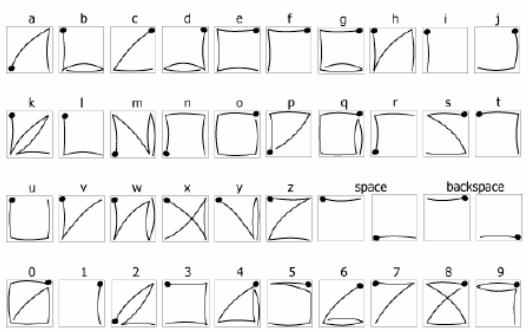
Ilj xuh#41#Sod|Vwdwrq ª#6#Ł#5338#Vrq|#Frp sxwhu# Hqwhuwdlqp hqw#

2. Other input method editor using an analog stick

There are some IME using an analog stick. Basically the principles can be categorized into two. One is simplifying the shape of character, and the other is making a rule of combination of direction for each character. EdgeWrite and myText are former one; Quikwriting, MDITIM and weegie are latter one.

2.1 EdgeWrite

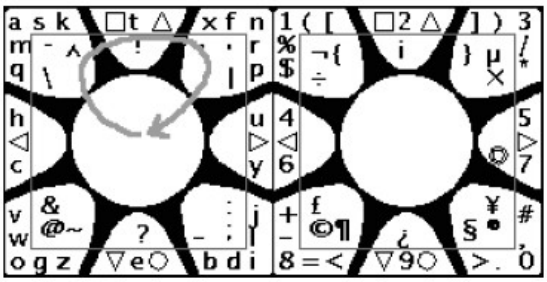
The EdgeWrite[1] text entry method was invented to help enter text with stylus to PDA. Each alphabet or number is equivalent to combination of movement of stick. Movement is detected when stick go thru some area around corners. Figure 2 shows equivalence between movements and the characters. [2]



Ilj xuh#51#Hgjh Z uwh#

2.2 Quikwriting

Quikwriting[3] is also stylus based input method originally. It separates input area into 9 areas. It detects combination of path thru the areas and outputs defined character. Figure 3 represents how movement can be converted to alphabet.[4]



Ilj xuh#61#Fxlnz uwkqj

2.3 MDITIM

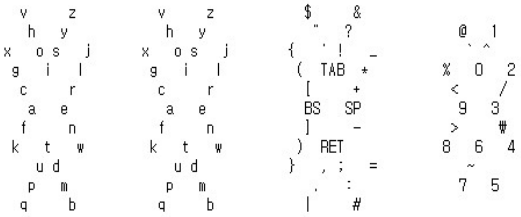
MDITIM[5] is very similar method with Quikwriting. Difference is just arrangement of alphabet. Figure 4 is an arrangement of alphabet and directions.

Glhfwlrqv	Fkdu#	Prg#	Glhfwlrqv	Fkdu#	Prg#
QVZ #	d#	D#	Z QHQ#	s#	S#
VHZ #	e#	E#	Z VHV#	t#	T #
HVZ #	f#	F#	Z VQ#	u#	U#
VZ H#	g#	G#	HVH#	v#	V#
Z HV#	h#	H#	VQH#	w#	W#
HVQH#	i#	I#	VHQ #	x#	X#
HVQV#	j#	J #	Z QZ V#	y#	Y#
Z VZ V#	k#	K#	Z QZ Q#	z #	Z #
Z QV#	l#	L#	VZ VQ#	{#	[#
VHVZ #	m#	M#	VZ VH#	|#	\#
Z VZ H#	n#	N#	VZ VZ #	}#	]#
VQV#	o#	O#	Z HQ#	-#	¥#
Z VZ Q#	p #	P #	QVH#	fi#	/#
QVQ#	q#	Q#	Z QHV#	´#	' #

Ilj xuh#71#P GIWIP #

2.4 weegie

weegie[6] is a personal project which allows an analog stick to use as text entry under X11 environment. As Figure 5 represented weegie also similar principles to writing alphabets.



Ilj xuh#81#z hhj lh

2.5 myText

myText[7] is a input method which convert simplified movement into alphabet. It is a commercial application but information is not open. Figure 7 is an example of typing alphabet using analog stick provided by corporation.

2.6 CLURD

CLURD[8] is a Hangeul IME using 4 arrow keys and one button. CLURD stands for center, left, up, right, down. It is not an analog stick IME, however arrow keys are somewhat similar to analog stick, so I will introduce this method. User inputs simplified version of Hangeul and system convert it to the Hangeul. Figure 6 shows how to input the Hangeul.

Ilj xuh#91#FOXUG

3. New analog stick input method editor

3.1 Principles of invention of Hangeul

Hangeul is invented by several scholars in 1443. Hangeul can be categorized into consonant and vowel, Consonant can be separated into 5 categories, guttural sound, velar sound, lingual sound, dental sound, and labial sound. Guttural sound includes ㅇ, ㅎ, velar sound includes ㄱ, ㄲ, ㅋ, lingual sound does ㄴ, ㄷ, ㅌ, ㄸ, dental sound does ㅅ, ㅆ, ㅈ, ㅊ, ㅉ, labial sound contains ㅁ, ㅂ, ㅃ, ㅍ. ㄱ, ㄴ, ㅁ, ㅅ, ㅇ is a basic consonants and others can be made by adding strokes or repeating letters. Vowels are made by combination of ㅣ, ㅡ, · which means human, ground, sky. [9]

Iljxuh#:1#p |Wh{w#

3.2 Description of principles

In this paper, I suggest a Hangeul analog stick input method editor. A principle of the method is similar to principles of invention of Hangeul. Base consonant, ㄱ,ㄴ,ㅁ,ㅅ is located into 4 directions, ㅇ is also basic consonant however there are only 4 directions for analog stick, and ㅇ has only ㅎ for variation; it is combined into ㅁ series. From the basic consonant clockwise rotation adds the strokes, counter-clock wise repeat writing letter. For example ㄱ(move stick to right) and rotate clockwise makes ㅋ which is made by adding stroke from ㄱ. ㅇ,ㅎ,ㄹ are the exceptions. Why ㅇ can not be basic direction is represented above, so ㅇ is located at counter-clockwise from ㅁ. Then ㅎ might be clock-wise from ㅇ because ㅎ is derived from adding stroke from ㅇ. But, to make ㅇ counter-clockwise rotation is needed and changing rotation is not good motion; ㅎ is derived from counter-clockwise from ㅇ. ㄹ is from adding stroke from ㄷ, but ㅌ is more intuitive letter for that position, so it is located at counter-clockwise from ㄴ which have same phonetic characteristics.

Inputting vowel uses its shape to determine base direction – short stroke points. For example to input ㅏ, move stick to the right. Similar to consonant, clockwise rotation adds the stroke like from ㅏ to ㅑ. Counter-clockwise rotation is used to input the other vowels, ㅐ is derived from ㅏ, so it can be inputted by counter-clockwise from ㅏ. ㅡ and ㅣ are also difficult to make position. I set ㅣ as ㅗ and counter-clockwise, ㅡ as ㅜ and counter-clockwise; because when people writes ㅣ, people often draw up to down first, when people writes ㅡ, people often draw left to right.

To separate consonant and vowel I use one additional button. When user presses the button, system think that user want to input vowel, otherwise consonant.

Figure 9 and 10 shows every combination of directions to input Hangeul.

4. Usability experiment

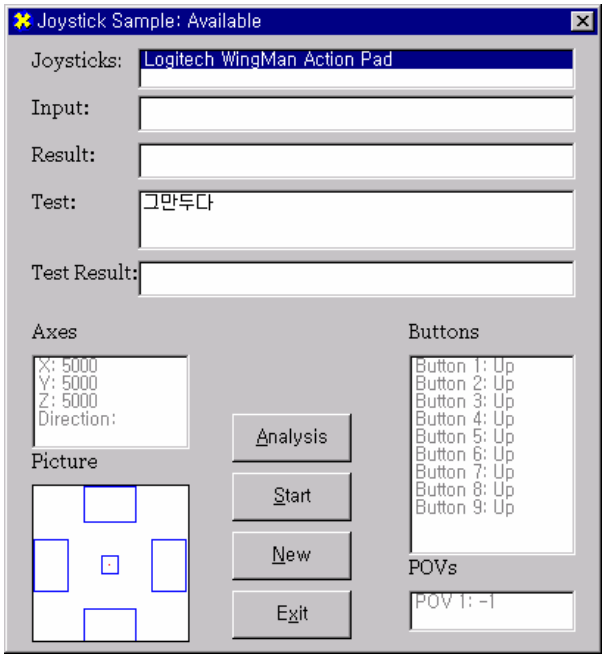
To know how this IME can be adopted to real situation I made simple demo and experiment application. It is made by Microsoft Visual Basic 6 using DirectInput from Microsoft DirectX 8.1 under Microsoft Windows XP.

Iljxuh#;1#Orjlwhfk#Z lqjP dq#Jdp hsdg1#P |#
h{shulp hqw#xvhg#wklv#dqdorj#vwlfn1#

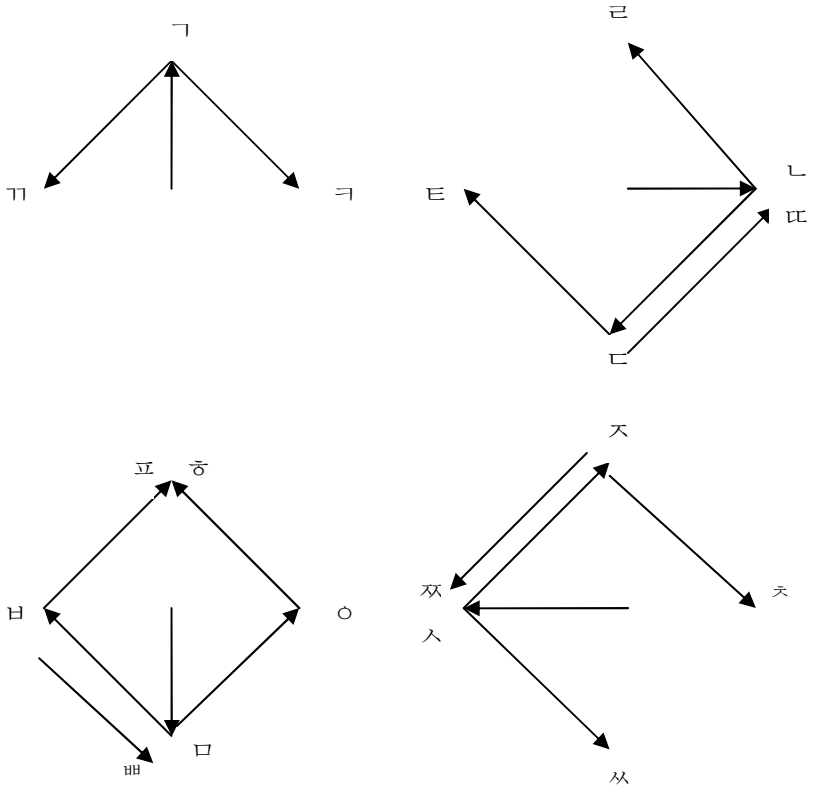
4 male users input 30 words which are selected from 2809 Korean words randomly using Logitech WingMan Gamepad analog stick shown as Figure 8. Length of words, number of stroke, spend time is

stored into files. This experiment is continued for four days except one people.

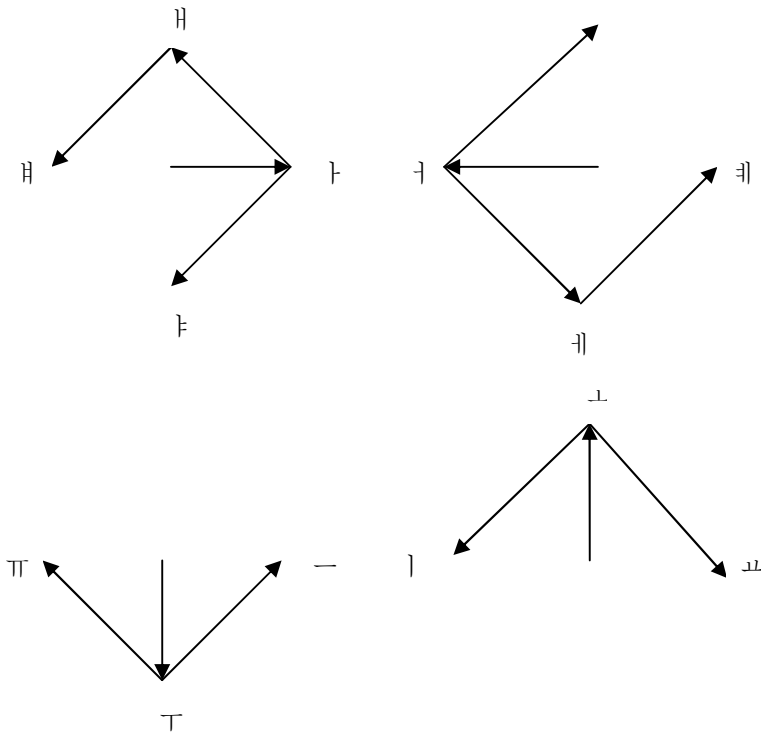
To explain the application specifically, DirectInput gets the position of stick as two dimensions, from 0 to 10000. Position is represented as PictureBox stands left bottom area on Figure 11; blue rectangles are area detects the directions. Button 1 is used to detect whether following movement is for consonant or vowel; Button 2 is for back-space, Button 3 is for space.



Ljxuh#41#P dlq#z lqgrz #ri#ghp r#dssdfdwrq#



Ljxuh#42#Sulqflsdo#ri#z uwqj#frqvrqdqw#



Ilj xuh#31#Sukqflsdnv#ri#zuwqj#yrz hov#
#

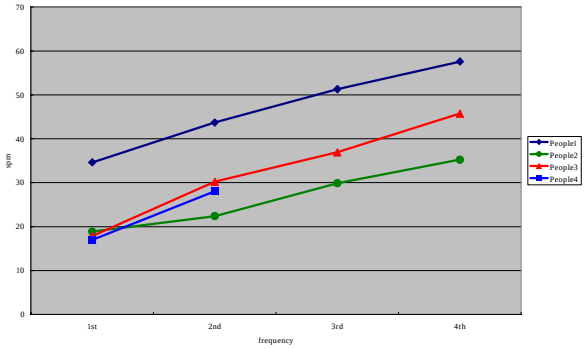
5. Experiment result

Experiment results are stores as file, Figure 15 is data analyzing application which get the data from file and print maximum strokes per minute – in this paper, strokes per minute (spm) means that how many consonants or vowels are inputted in one minute – minimum strokes per minute, average strokes per minute and average characters per minute for one experiment.

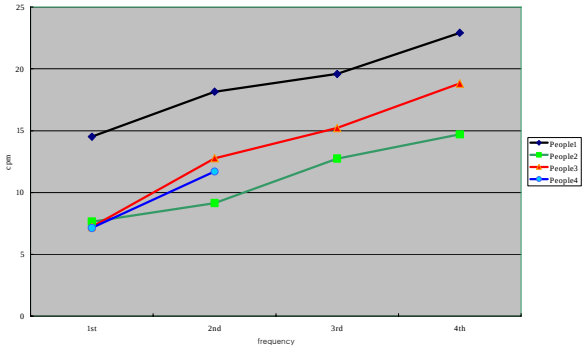
	People1	People2	People3	People4
1st	34.652	18.858	17.865	17.019
2nd	43.7	22.389	30.205	28.073
3rd	51.293	29.867	36.941	
4th	57.576	35.237	45.738	
	46.805	26.588	32.687	22.546

Ilj xuh#45#Uhvxow#ri#dyhudj h#vwurnhv#shu#p lqxwhv#
#

For four days of experiment, as time goes by, everyone can input the letters faster and faster. Finally one test reaches 50 strokes per minute at final session. Figure 13 shows graph of strokes per minute, Figure 14 shows graph of characters per minute.



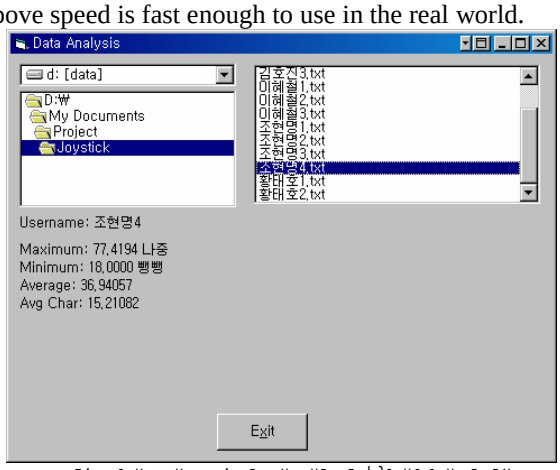
Ilj xuh#46#Vwurnhv#shu#p lqxwh#
#



Ilj xuh#47#Fkdudfwhuv#shu#p lqxwh#

Average speed represented as strokes per minutes is

32.16 spm. There's no special Hangeul IME using an analog stick, comparison is difficult, so I compare with keypad Hangeul input method editor such as Cheon Ji In, ez-Hangeul. [10] said that people who adapt the method very well can input the characters faster than 200 spm with two-handed. If they use only one hand, the speed is fall down to 100 spm. With consideration that number of buttons for keypad is more than 12 though analog stick has only 1 stick and 1 button, testers for this experiment are not adapted very well; above speed is fast enough to use in the real world.



Ilj xuh#181#Surjudp #wr#dqdo}h#wkh#gdwd#

#

6. Conclusion

From the experiments, we can conclude that the speed of new IME is practical enough to adopt real system. This IME can be adopted not only input device for console but also input device for very small computers such as watch computers. With more organized research, this idea can be a useful method for next generation computing world.

7. References

[1] Jacob O. Wobbrock, Brad A. Myer and Htet Htet Aung, "Writing with a Joystick: A Comparison of Date Stamp, Selectioln Keyboard, and EdgeWrite", CHI 2004.

[2] Jacob O. Wobbrock, Brad A. Myers and John A. Kembel, "EdgeWrite: A Stylus-Based Text Entry Method Designed for High Accuracy and Stability of Motion", Proceedings ofUIST 2003, 61-70.

[3] Poika Isokoski and Roope Raisamo, "Quikwriting as a Multi-Device Text Entry Method", Proceedings of NordiCHI 2004, 105-108, ACM Press, 2004.

[4] Ken Perlin, "Quikwriting: Continuous Stylus-based Text Entry", Proceedings of the ACM Symposium on User Interface and Software Technology, UIST '98, ACM Press (1998), 215-216.

[5] Poika Isokoski and Roope Raisamo, "Device Independent Text Input: A Rationale and an Example", Proceedings of the Working Conference on Advanced Visual Interfaces AVI2000, ACM Press (2000), 76-83.

[6] Coleman, M., 2001, Weegie, http://weegie.sourceforge.net/

[7] Co-operwrite, 2002, Mytext web site, http://www.my-text.com/co-operwrite.html

[8] http://www.clurd.com

[9] 정연종, " 한글은 단군이 만들었다" , 도서출판 죠이정 인터내셔날, 1996

[10] 동아일보, "[e-피플]문자메시지 ' 고수' 한국통신프리텔 임기정씨", 2000 http://www.dongailbo.co.kr/fbin/moeum?n=k$69&a=v&l=2&id=200012030161