ITU-T Kaleidoscope Conference
Innovations in NGN

Positional Gesture for Advanced Smart Terminals: Simple Gesture Text Input for Syllabic Scripts Like Myanmar, Khmer and Bangla

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NGN ⇔Human Communication with Various Kinds of Mobile Terminals

Nintendo DS Lite

Sunman Kwon's
Wearable Mobile Device

Nintendo Wii
Remote Controller

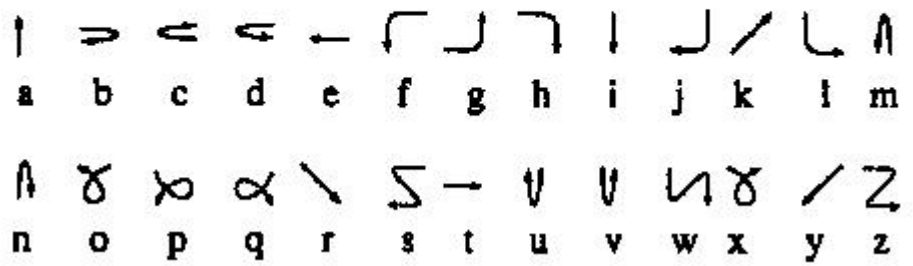
Apple Inc. iPhone

NTT DoCoMo D800iDS
Mobile Phone

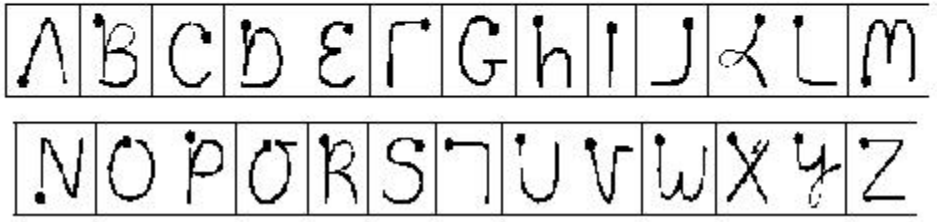
I-Tech Virtual Laser Keyboard

Related Works: Unistroke & Graffiti

Unistroke [Goldberg 93]

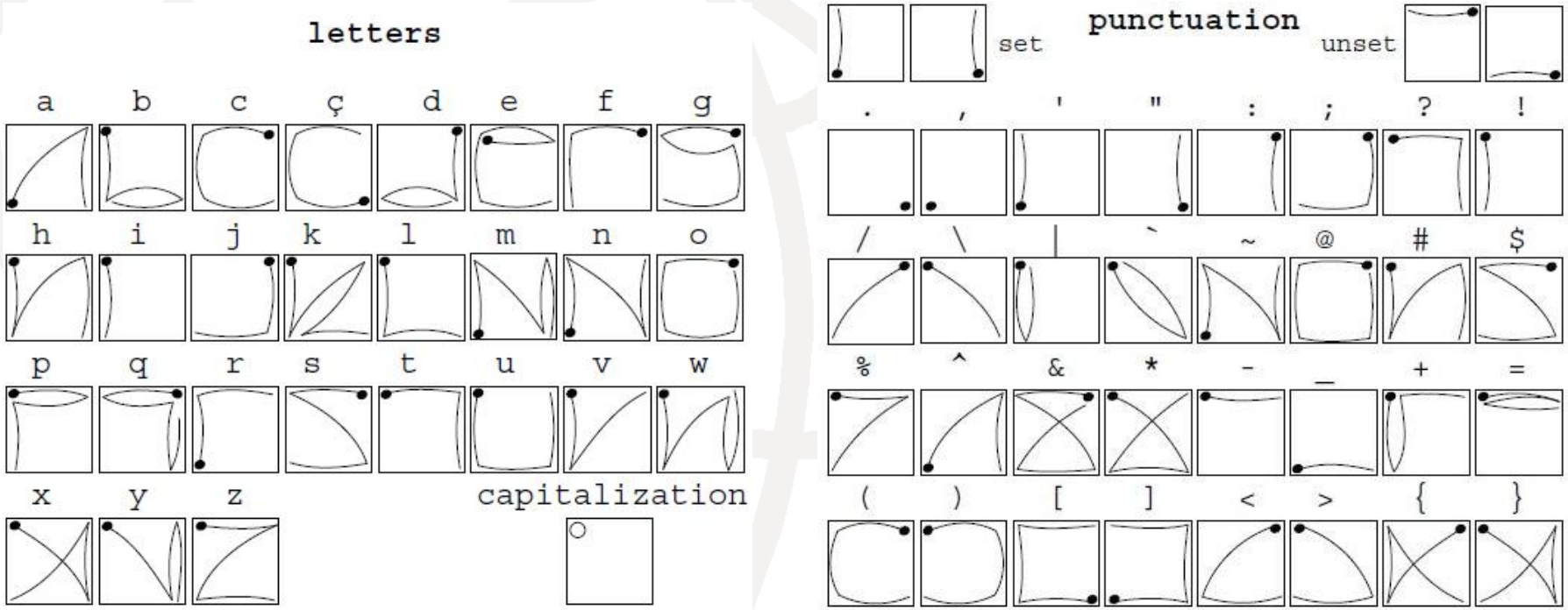


Graffiti



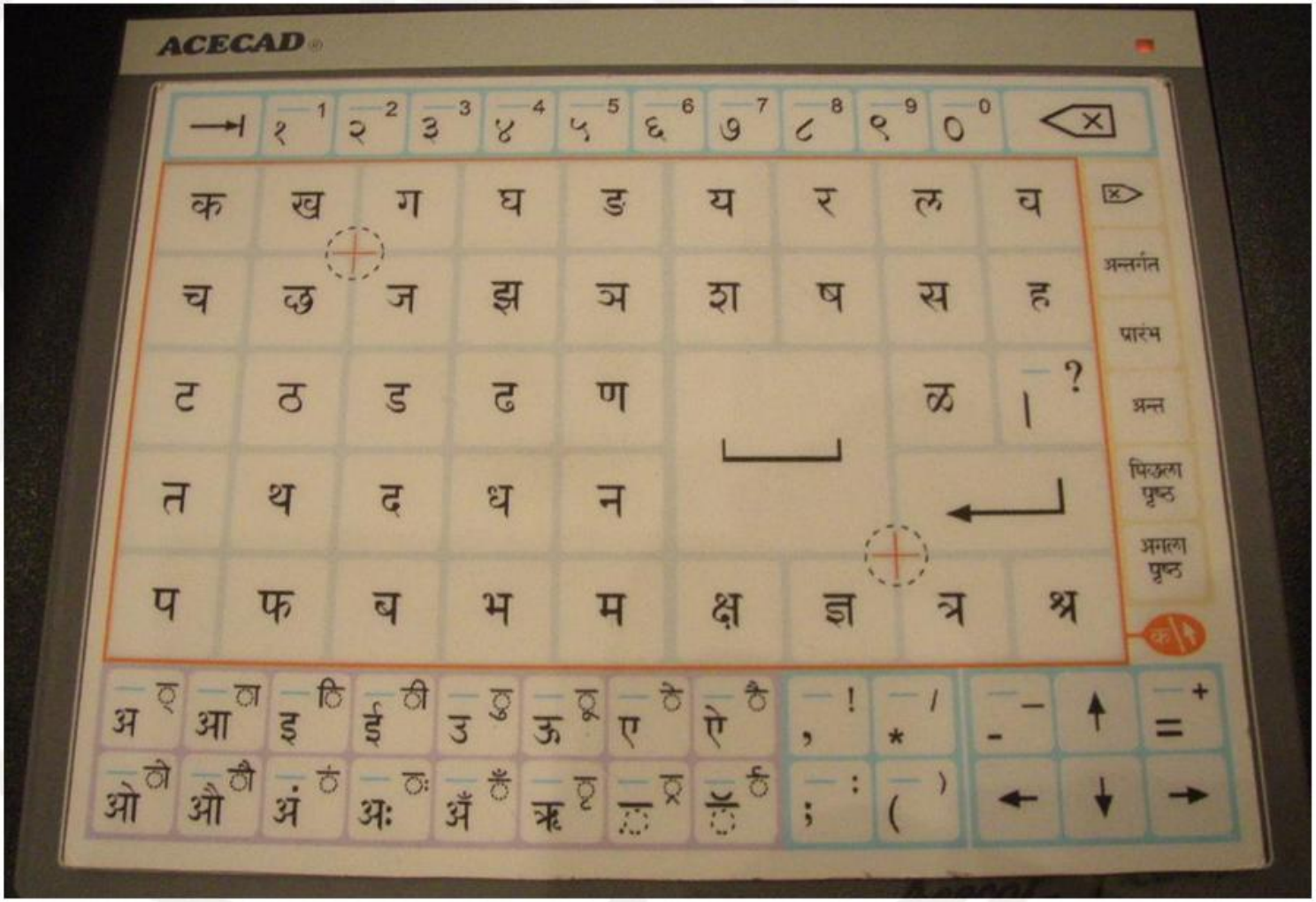
Proposed by Palm Inc.

Related Works: EdgeWrite Alphabet Version 3.0.1

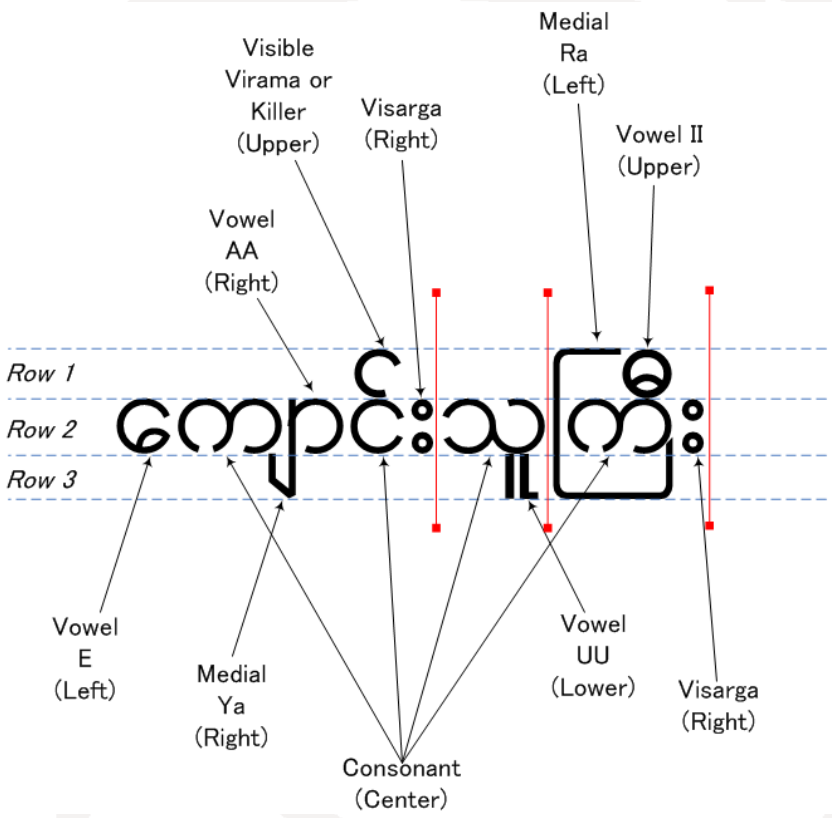


Proposed by Wobbrock, J.O. (2006)

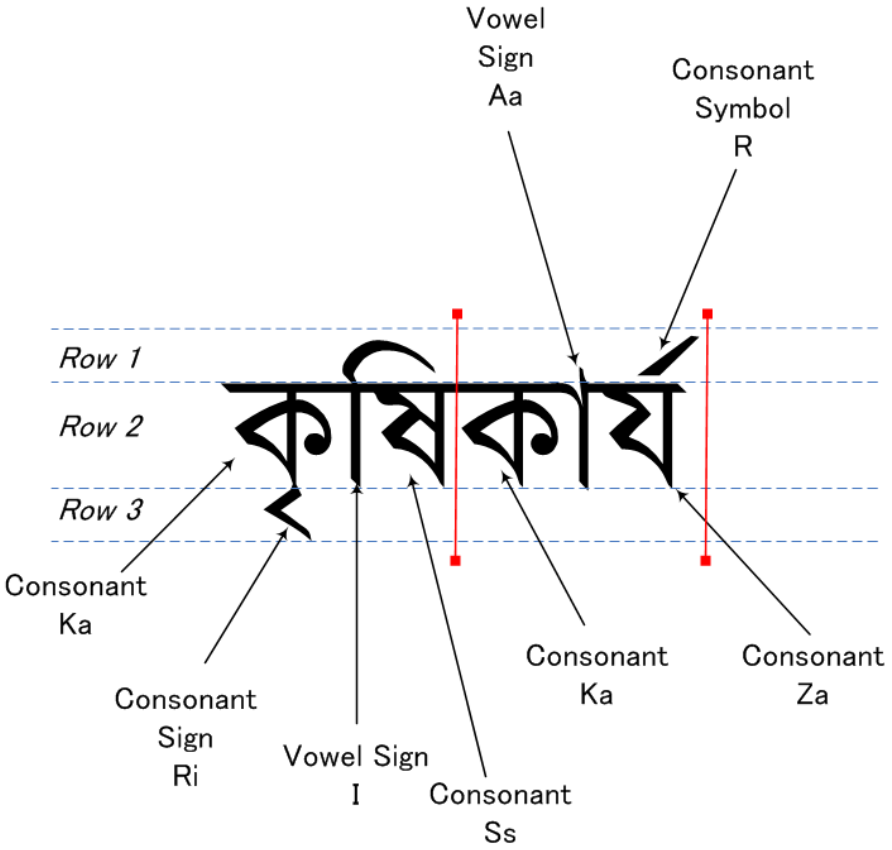
Gesture Keyboard (GKB) for Devanagari (One of Indic Scripts)



Analysis on Syllabic Based Scripts

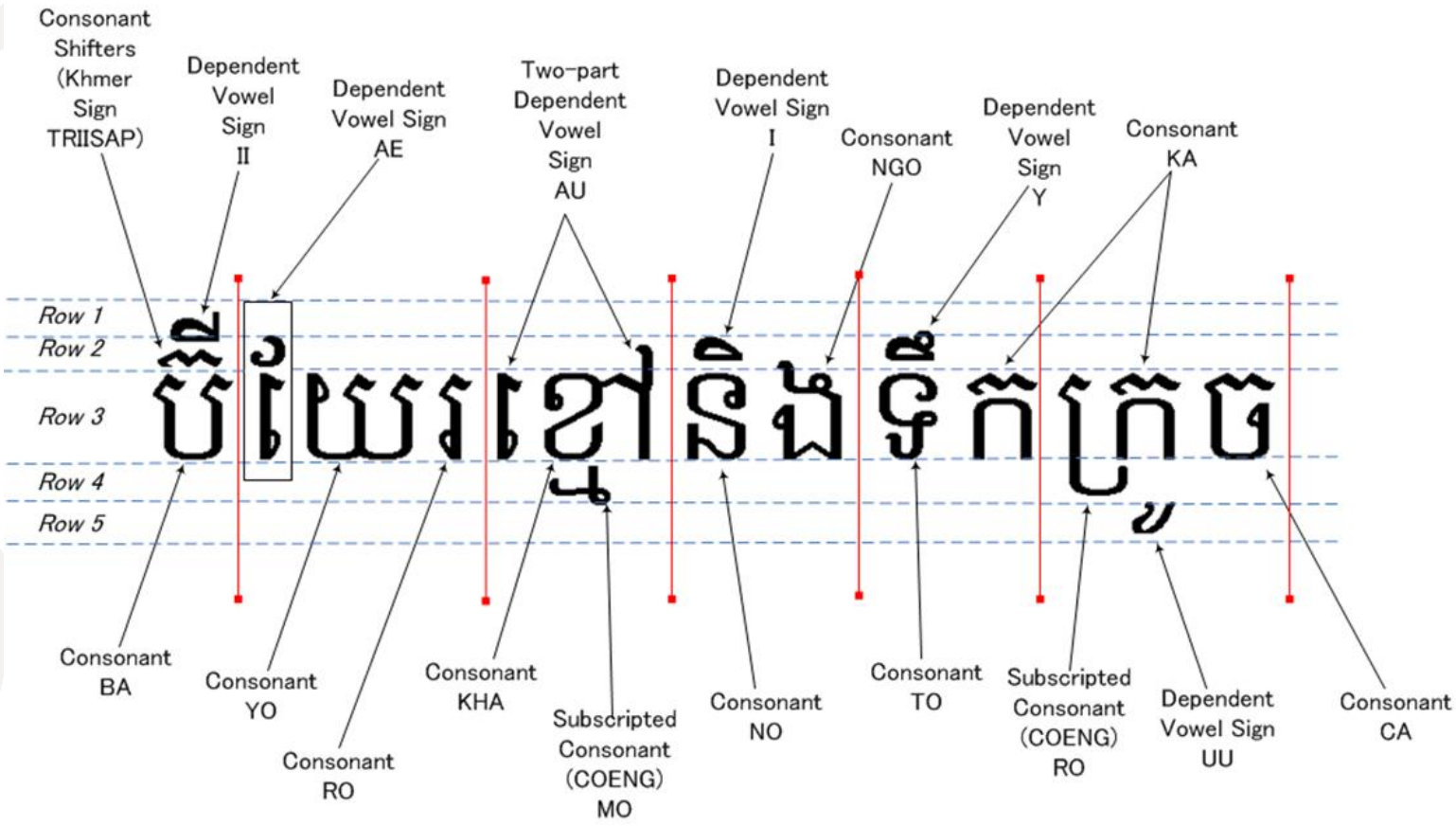


Myanmar Language



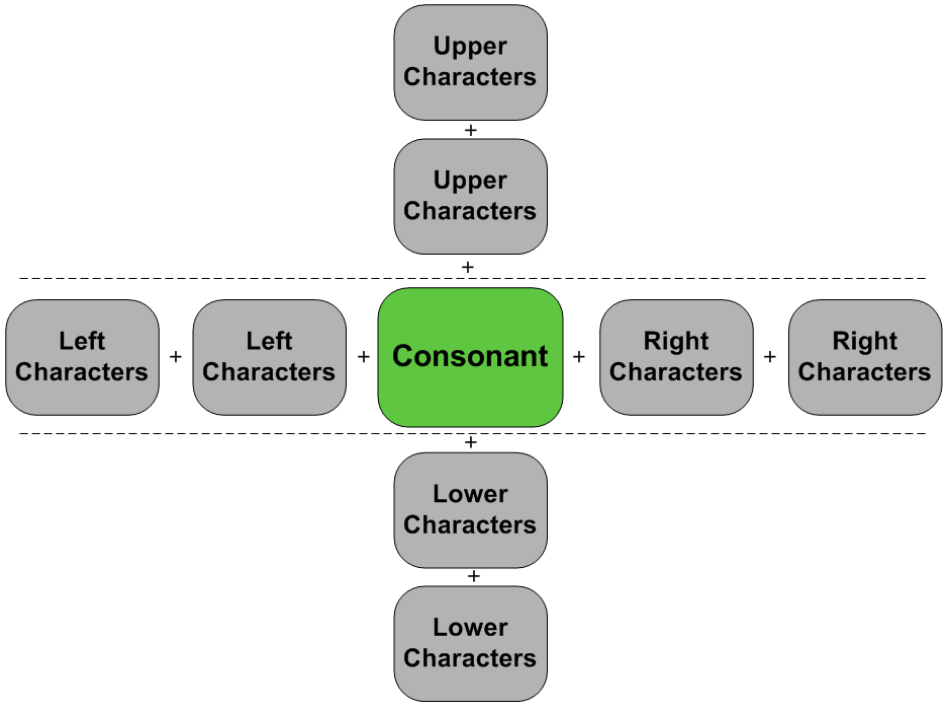
Bangla or Bengali Language

Analysis on Syllabic Based Scripts (cont'd)

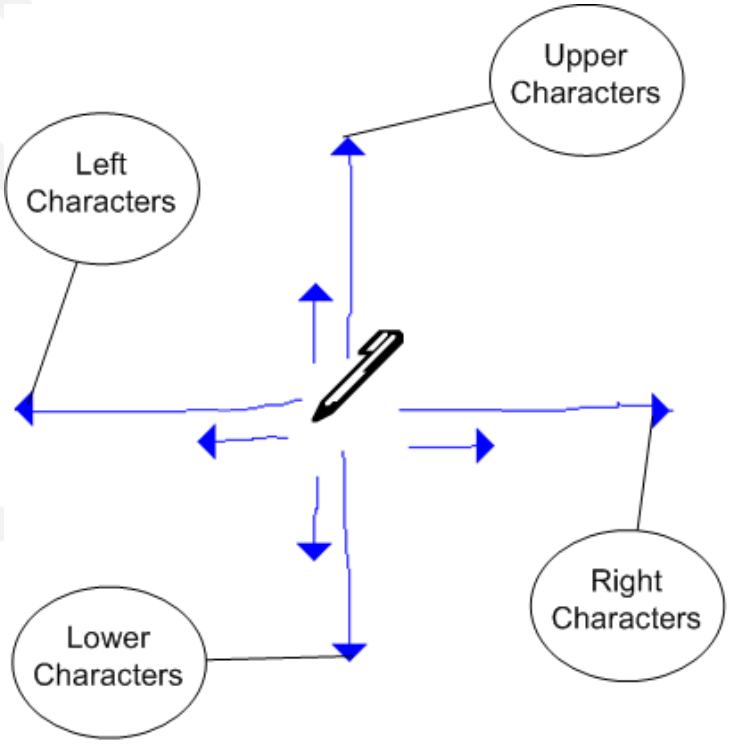


Khmer Language

Concept of Positional Gesture



Logical Structure of a Consonant Cluster



Positional Gesture

Gesture Commands

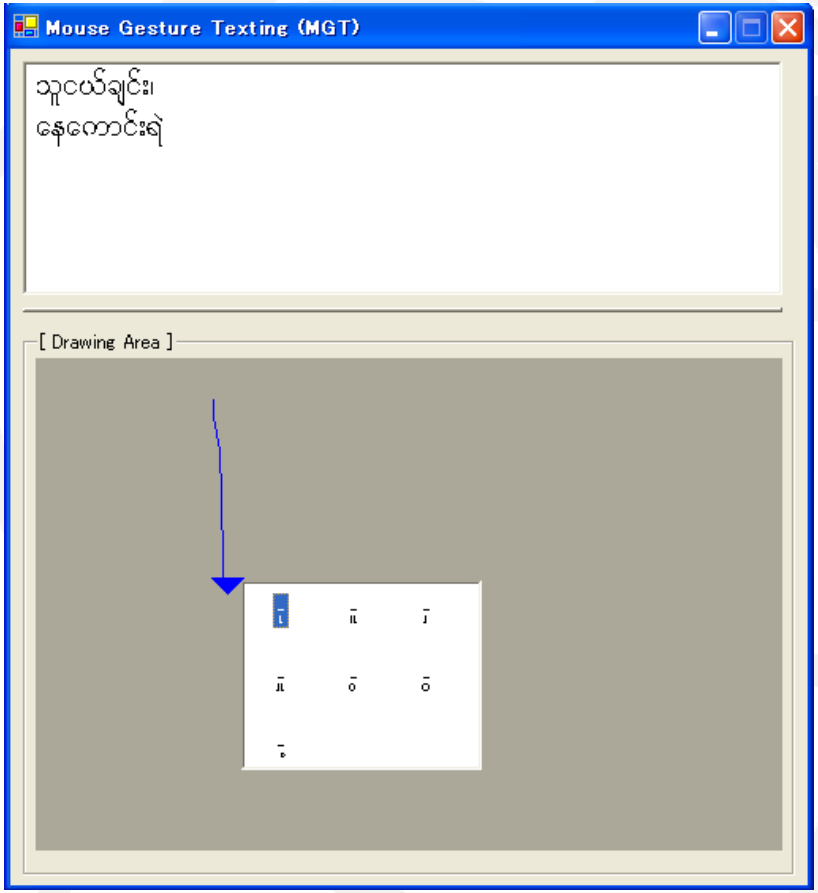
Gesture Commands	Character Assignments
Left (long)	Left characters ("ေ", "ြ")
Right (long)	Numbers ("၁", "၂", "၃", "၄", "၅" etc.)
Up (long)	Symbols ("@", "!", "&", "$", "%" etc.)
Down (long)	Subscript consonants ("္က", "္ခ", "္ဂ", "္ဃ", "္စ" etc.)
Left (short)	Consonant characters ("က", "ခ", "ဂ", "ဃ", "င" etc.)
Right (short)	Right characters ("ျ", "ာ", "း", "၊", "။")
Up (short)	Upper characters ("ီ", "ဲ", "ံ" etc.)
Down (short)	Lower characters ("ု", "ူ", "့", "ွ", "ှ" etc.)

for Myanmar

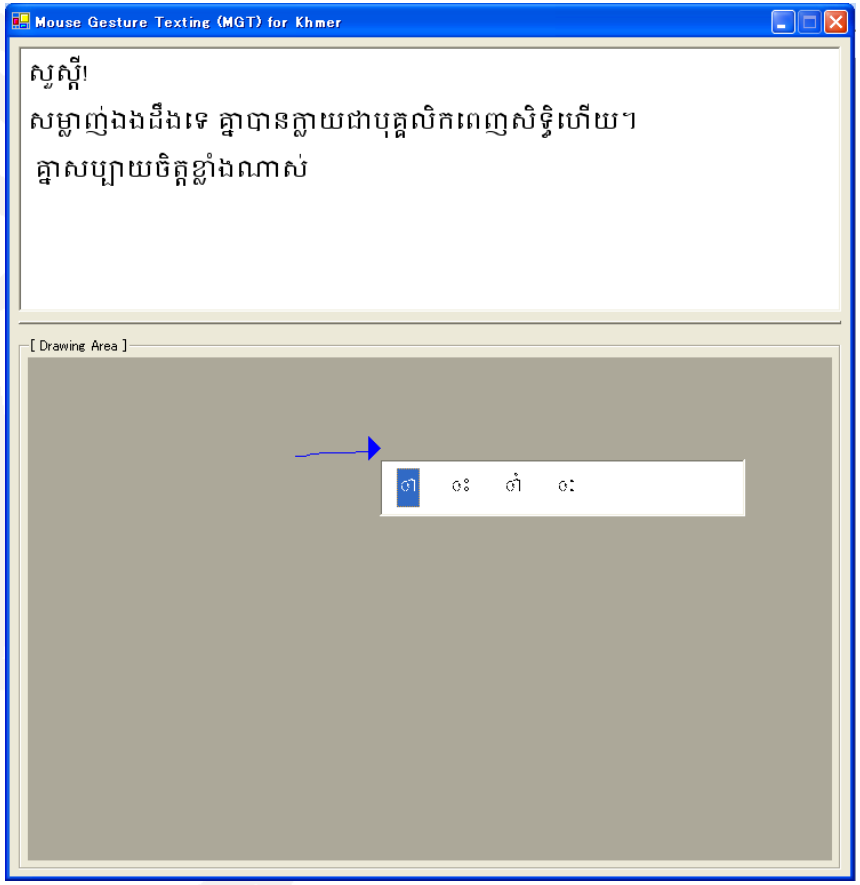
Gesture Commands	Character Assignments
Left (long)	Left, Right characters ("ឿ", "ៀ", "ោ" etc.)
Right (long)	Numbers ("១", "២", "៣", "៤" etc.)
Up (long)	Symbols ("។", ",\"", "?", "!", "#" etc.)
Down (long)	Independent vowels, Symbols and frequently used characters ("ឱ", "ឮ", "។ល។", "ៗ" etc.)
Left (short)	Left characters ("េ", "ែ", "ៃ", "ើ")
Right (short)	Right characters ("ា", "ះ", "ាំ", "ៈ")
Up (short)	Upper characters ("ិ", "ី", "ឹ", "ឺ" etc.)
Down (short)	Lower characters ("ុ", "ូ", "ួ" etc.)
Double Click	Consonant characters ("ក", "ខ", "គ", "ឃ", "ង" etc.)

for Khmer

Positional Gesture Prototypes



for Myanmar



for Khmer

Experiment Procedures

- Explaining the concept of Positional Gesture text input
- Making demonstration of text input with Positional Gesture prototype and NiDA software keyboard
- Allowing 10 minutes practice time for each user to learn text input with Positional Gesture prototype and software keyboard

Experiment Procedures (cont'd)

- Recording users' typing speeds of short Khmer message for 5 trial times (including error correction time)
- Getting users' feedback for our Positional Gesture prototype and NiDA software keyboard with small questionnaires

Myanmar Text for User Study

သူငယ်ချင်း၊
မတွေ့ရတာ ကြာပြီနော်။
နေကောင်းရဲ့လား။
ငါဖုန်းနံပါတ်အသစ်က ၅၀၀၇၅၅၉၉၊
အားတဲ့အခါ ဖုန်းပြန်ဆက်ကွာ။
ဒါနော်။

(6 sentences which contain 107 characters including spaces)

Khmer Text for User Study

សួស្តី!

(Hi!)

សម្លាញ់ឯងដឹងទេ គ្នាបានក្លាយជាបុគ្គលិកពេញសិទ្ធិហើយ។

(You know ,friend, I am now accepted to be a contract employee.)

គ្នាសប្បាយចិត្តខ្លាំងណាស់។

(I'm extremely happy.)

ថ្ងៃទី២០ ខែ៨នេះគ្នានឹងបានចូលធ្វើការហើយ។

(I will start my work on 20 of August.)

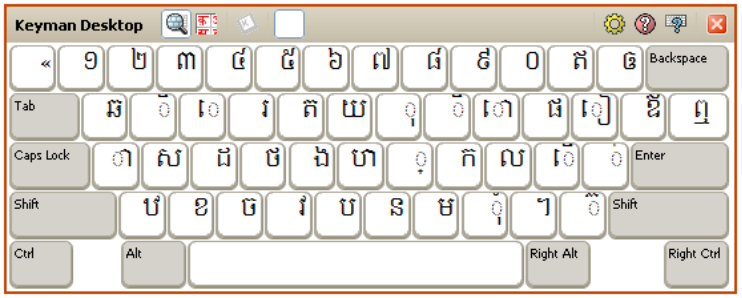
ជួបគ្នាថ្ងៃក្រោយ

(See you next time)

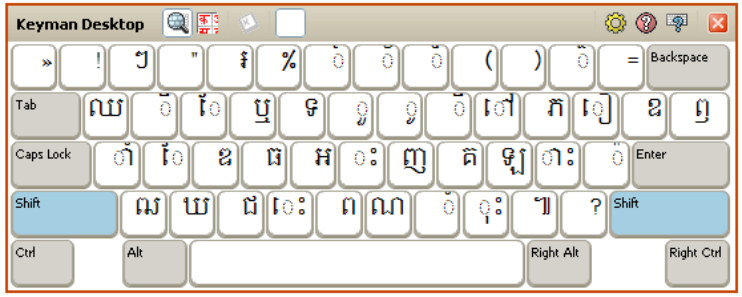
(5 sentences which contain 135 characters including spaces)

User Study with Native Participants

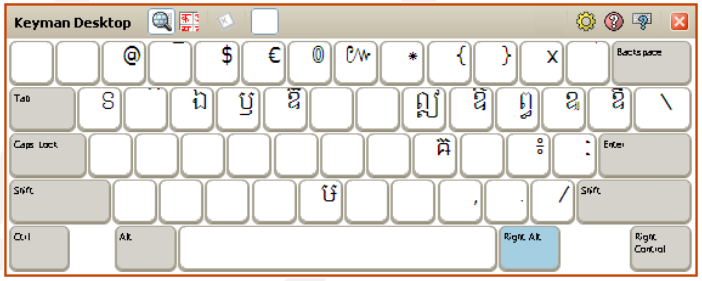
NiDA Software Keyboard for Comparison



NiDA Software Keyboard Layout (Unshifted Mode)

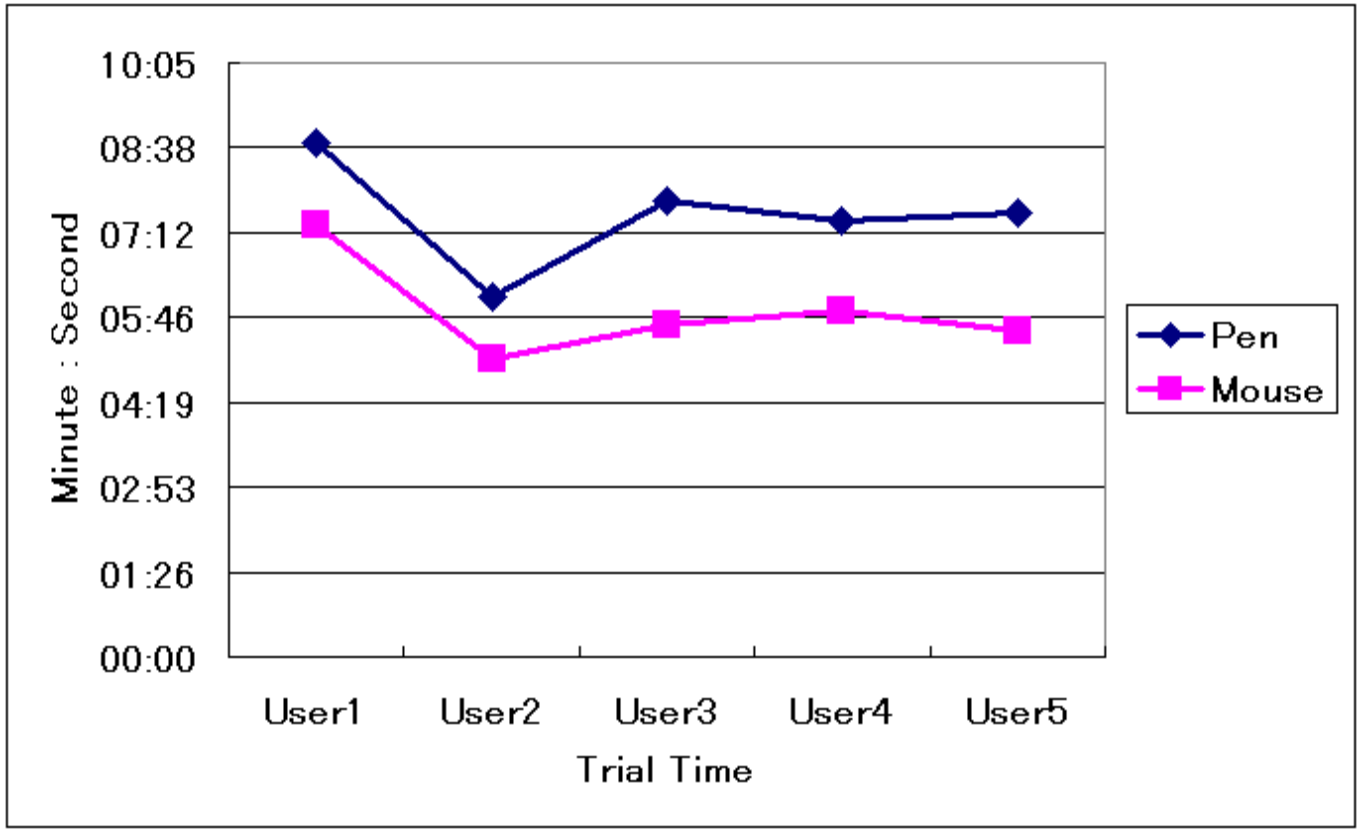


NiDA Software Keyboard Layout (Shift Mode)



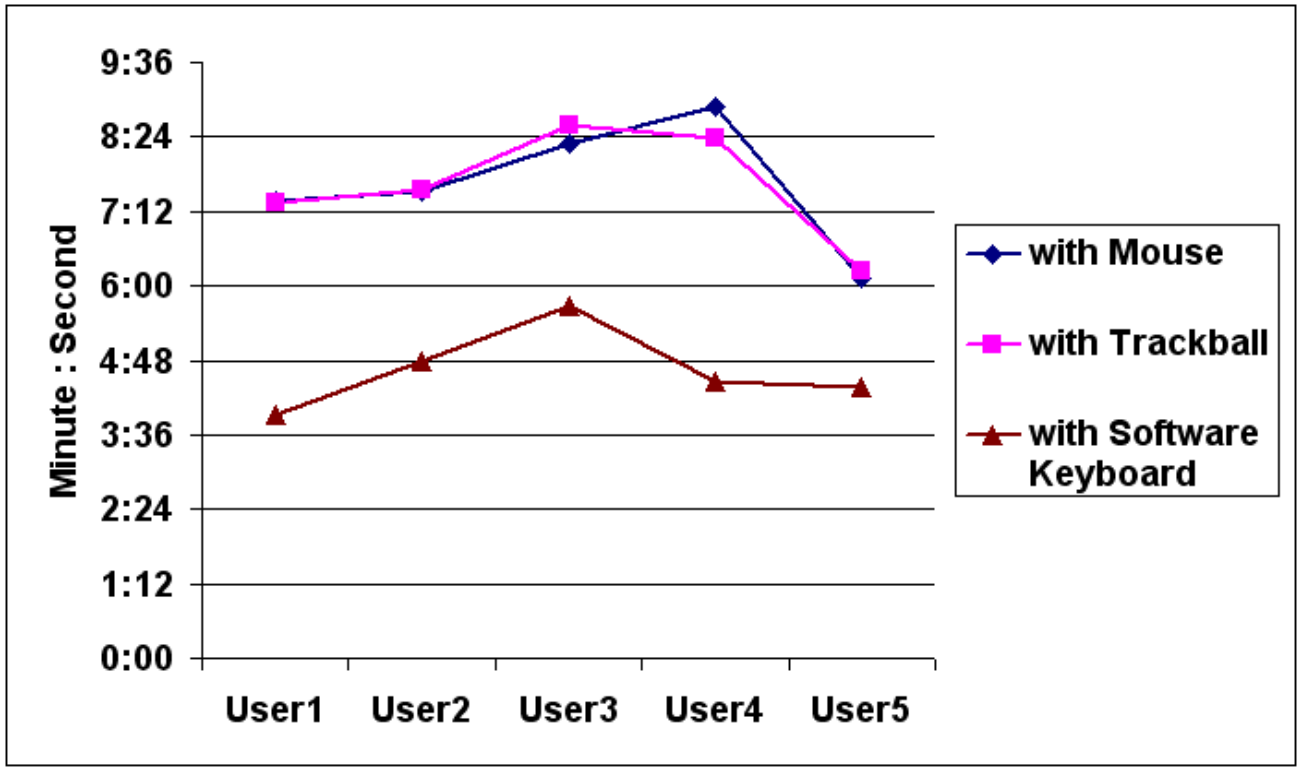
NiDA Software Keyboard Layout (Right Alt Mode)

User Study Result for Myanmar



Typing Speed Improvements of 5 Myanmar Users for Positional Gesture with Mouse and Pen

User Study Result for Khmer



Typing Speed Comparison of 5 Cambodian Users with Mouse, Trackball and Software Keyboard

Characters per Minute (CPM)

- for Myanmar Language
  - Positional Gesture with mouse:19.27 CPM
  - Positional Gesture with pen: 14.29 CPM
  - Win Myanmar Software Keyboard: 42.8 CPM
- For Khmer Language,
  - Positional Gesture with mouse: 17.69 CPM
  - Positional Gesture with trackball: 17.72 CPM
  - Khmer Software Keyboard: 29.13 CPM

Result of Likert Scales by Myanmar Users

Likert Scales (range 1-5)	PG with Pen	PG with Mouse
Difficult-Easy	3.4 (0.89)	4.6 (0.55)
Painful-Enjoyable	3.6 (0.55)	3.4 (1.14)
Slow-Fast	3.0 (0)	4.2 (0.84)
Dislike-Like	4.4 (0.89)	4.6 (0.55)

Mean (Standard Deviation) Responses by 5 Myanmar Users for 5-point Likert Scale Questions

Result of Likert Scales by Cambodian Users

Likert Scales (range 1-5)	PG with Trackball	PG with Mouse	Software Keyboard
Difficult-Easy	2.0 (1.22)	3.2 (0.84)	4.2 (1.30)
Painful-Enjoyable	2.6 (1.14)	3.6 (0.89)	3.8 (1.10)
Slow-Fast	2.0 (0.71)	3.4 (1.14)	3.8 (1.10)
Dislike-Like	2.8 (1.79)	4.0 (0.71)	4.0 (1.22)

Mean (Standard Deviation) Responses by 5 Khmer Users for 5-point Likert Scale Questions

Conclusion and Future Work

- The proposed gesture idea is a very simple, user-friendly and possible Khmer text input method on computing devices.
- Moreover, the concept is applicable to many pointing devices or input devices such as mouse, TouchPad, TrackPoint, trackball, pen with tablet, touch screen and data glove etc.
- Positional Gesture with touch screen interface can be the best user interface.
- As a next step, we plan to extend it to Thai and Hindi, and make an analysis of typing error rate as well.