

The Schwem-Dante Layout (SDL)

A Reference Design for One-Handed Gesture-Based Text Entry

Author: Floof Logic

Date: April 02, 2025

Introduction

In 2014, there was a desire to improve upon the current touch-based keyboards that mobile phones were using. Rather than continue relying on the legacy QWERTY layout, the goal was to embrace the touchscreen from the ground up. The aim of the redesign was to provide a gesture-based system that could be used with one hand and operated without needing visual attention. User experience research revealed that a simple circular motion with the thumb was a near-universal motion and could be repeated to input characters. Adam Schwem designed the original layout, with assistance from John Leimon in August 2014, and created the first reference implementation for Android. The initial implementation supported only the English alphabet, alongside a core set of symbols and numbers. Character locations were based on frequency of use, enabling shorter gestures for more common letters. Glyphs such as parentheses used symmetric gestures to improve spatial logic. The keyboard was usable by the blind, those with only one hand, and even allowed two-thumb use for greater speed. However, in practice, a fatal flaw emerged: the friction between a user's thumb and the touchscreen produced excessive heat, rendering prolonged use uncomfortable. Despite this, the reference implementation remains an important piece of research. Floof Logic maintains a JavaScript reference implementation as a resource for future studies in accessible keyboard design. The original Android implementation is available upon request.

Reference Diagram

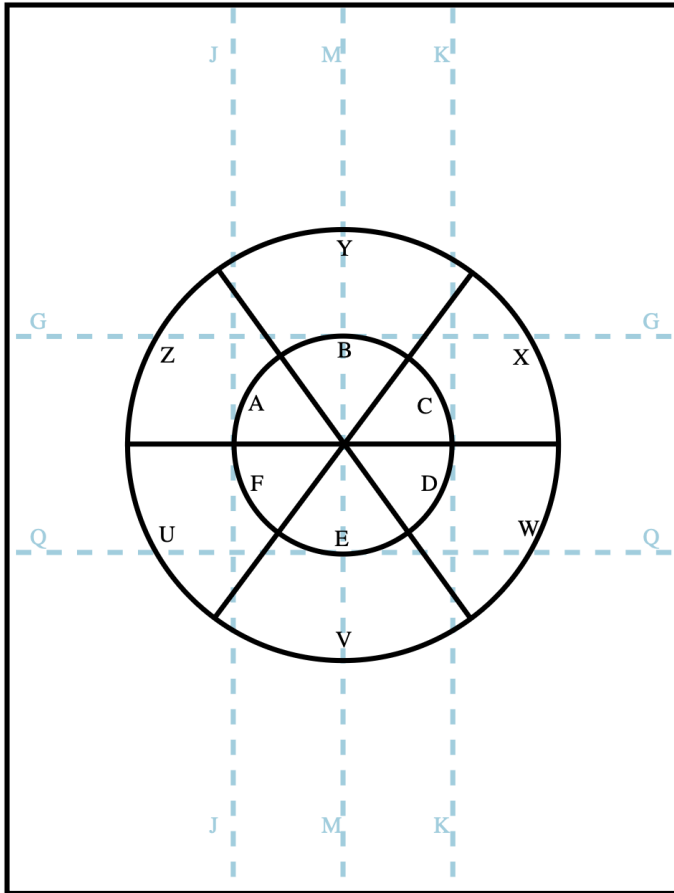
The Schwem-Dante Layout (SDL)

A Reference Design for One-Handed Gesture-Based Text Entry

The diagram below illustrates the original Schwem-Dante Layout reference implementation.

DANTE-000 REV. X1

05 SEP 2014



Schwem's Basic Set

oAiA A
oBiB Space
oCiC E
oDiD I
oEiE U
oFiF O
oAiB H
oAiC G
oAiD
oAiE K
oAiF S
oBiA '
oBiC !
oBiD ?
oBiE .
oBiF ,
oCiA F
oCiB T
oCiD N
oCiE V
oCiF Z
oDiA
oDiB X
oDiC L
oDiE C
oDiF P
oEiA B
oEiB
oEiC Q
oEiD W
oEiF M
oFiA R
oFiB Y
oFiC
oFiD J
oFiE D

Schwem's Extended Set

oAoZiY 2
oAoZiX 3
oAoZiW]
oAoZiV @
oAoZiU [
oBoYiX 6
oBoYiW >
oBoYiV \$
oBoYiU <
oBoYiZ 4
oCoXiW }
oCoXiV #
oCoXiU {
oCoXiZ 7
oCoXiY 8
oDoWiV *
oDoWiU /
oDoWiZ -
oDoWiY =
oDoWiX +
oEoViU (
oEoViZ :
oEoViY "
oEoViX ;
oEoViW)
oFoUiZ
oFoUiU
oFoUiX
oFoUiW
oFoUiV
oAoZiZ 1
oBoYiY 5
oCoXiX 9
oDoWiW \
oEoViV Ø
oFoUiU

dGdQ Clear Screen

uQuG Capitalize Next Alpha

Annotated Research Summary

Modern research supports the idea that gesture-driven, one-handed keyboard layouts can greatly improve accessibility on touch devices.

ACCESSIBILITY FOR USERS WITH VISUAL IMPAIRMENTS:

- "Accessible Gesture Typing" (Billah et al., 2019): Introduced a gesture-typing model for blind users that increased typing speed by 35% and reduced errors by 62%.

The Schwem-Dante Layout (SDL)

A Reference Design for One-Handed Gesture-Based Text Entry

- "SwingBoard" (Ahmed & Farrok, 2024): Swipe-based keyboard with 8 directional zones achieved ~20 WPM with 88% accuracy for blind users.
- "BrailleSketch" (Li et al., 2017): Enabled users to sketch Braille paths on touchscreens, achieving 14.5 WPM.
- "BrailleTouch" (Southern et al., 2012): Chorded input for blind users reached 23 WPM and showed strong tactile memory transfer.

ACCESSIBILITY FOR MOTOR IMPAIRMENTS & ONE-HANDED USE:

- Zhang & Deng (2022): Adaptive, curved layouts optimized for thumb reach outperformed QWERTY after short training.
- Sesto et al. (2013): Larger touch targets (up to 30mm) significantly improved typing speed and accuracy for users with motor impairments.

INCLUSIVE DESIGN PRINCIPLES:

- Designing for one-handed use benefits all users, including those in situational contexts (e.g. carrying items).
- WCAG and major platform guidelines recommend minimum button sizes of 44-48dp for improved usability.
- Gestures should be simple and paired with alternative input methods. Feedback (audio, vibration) helps users understand gestures in real time.

CONCLUSION:

Gesture-based, one-handed keyboards can significantly enhance accessibility and typing efficiency

The Schwem-Dante Layout (SDL)

A Reference Design for One-Handed Gesture-Based Text Entry

across a wide range of user needs and contexts.