

# The Dvorak Element of the Symmetric Group

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Gatsby Unit, Tea Talk

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# Topic: Typewriters → Efficient Touch Typing



- First mechanical typewriters: ABCD. . .
- Experienced typist: frequent jams  $\Rightarrow$
- Manufacturers [Christopher Sholes, 1873]:
  - place co-occurring keys far (language specific),
  - “slow” the typist down.

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  - place co-occurring keys far (language specific),
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- = QWERTY design.

# Some Statistics: Accuracy, Students' Age Distribution

92%



## Average Accuracy

Average typist makes 8 typos for every 100 words typed

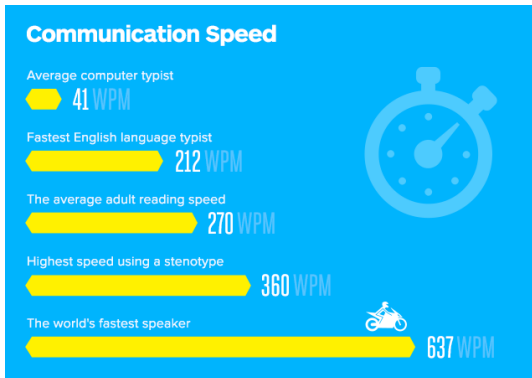
## Age Distribution

Young people under 18 made up the largest age group of all typing students.

They learn to type faster while in school or before getting their first job.



# Speed: WPM = words per minute



Online typing test:

<http://www.ratatype.com/typing-test/#wpm>

# Motivation

Fastest English language typist:

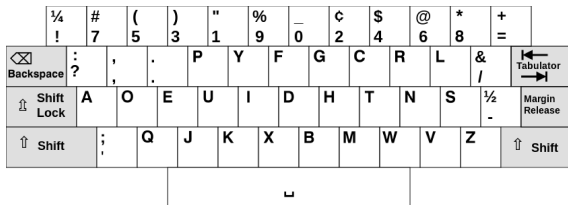
- Barbara Blackburn (2005),
- 150 wpm for 50 minutes,
- peak typing speed: 212 wpm,
- using Dvorak simplified keyboard.

:	?	.	P	Y	F	G	C	R	L	
:	,	.								
A	O	E	U	I	D	H	T	N	S	
	Z	Q	J	K	X	B	M	W	V	'
										-

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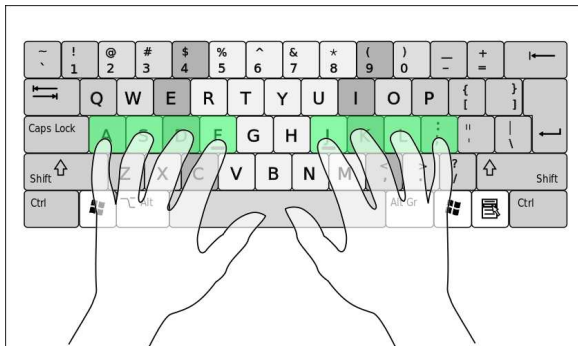
- August Dvorak:
  - professor of education (University of Washington, Seattle),
  - advisor of an MSc thesis on typing errors,
  - studied the Qwerty layout.
- Joint work with William Dealey (his brother-in-law).
- Conclusion: design a new keyboard layout.

# An Alternative: DSK (Dvorak Simplified Keyboard)

- Having
  - reviewed slow-motion films of typists,
  - studied
    - most used letters and letter combinations,
    - physiology of the hand.
- 1932 = DSK Patent.
- 1936: Typewriting Behavior: Psychology Applied to Teaching and Learning Typewriting (500 pages).

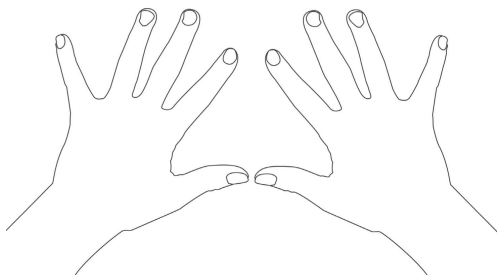
# Qwerty Defects: Hand Overload

- Using fingers of the same hand without rest:
  - slow, more uncertain typing.
  - does not allow “play for position”.
- Fastest and easiest strokes:
  - home row,
  - on opposite hands.



# Defects+: Unbalanced Finger Loads

- Standard layout:
  - overwork certain fingers,
  - underworks others.
- It should be proportional to their strength, dexterity.



# Defects+: Excess Finger Movement

- Fingers jump over the home row far too often.
- Only 32% of all typing is done at the home row.
- $\Rightarrow$  wasted motion, fatigue.



# Defects+: Awkward Strokes

- Many high-frequency letter combinations:
  - unnecessarily complex,
  - difficult to execute.
- Example: “December”.
- Results in
  - many errors,
  - lower typing speed.

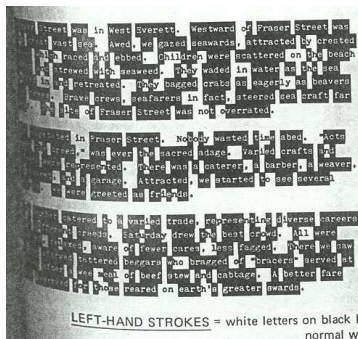
# Better Hand Alternation; Awkward Strokes → min

Home row:

- vowels (40% of all typing) = left.
- major consonants = right.

:	?	.	P	Y	F	G	C	R	L	
A	O	E	U	I	D	H	T	N	S	
Z	Q	J	K	X	B	M	W	V	'	-

Off-home characters: minimize awkward strokes (speed: × 3).



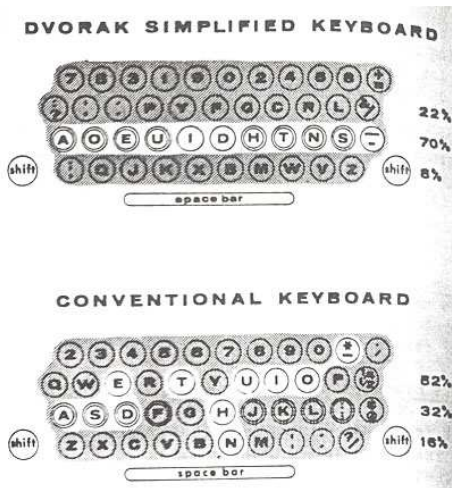
Fraser Street was in West Everett. Westward of Fraser Street was  
the great west sea. Awee, we gazed seawards, attracted by crested  
children were scattered on the beach  
edged and strayed with seaweed. They waded in water as the sea  
surged in and retreated. They bagged crabs as eagerly as beavers  
in trees. Brave crews, seafarers in fact, steered sea craft far  
the of Fraser Street was not overrated.

in Fraser Street. Nobody wasted time abed. Acts  
was ever the sacred adage. Varied crafts and  
represented, there was a caterer, a barber, a weaver,  
and a garage. Attracted, we started to see several  
were greeted as friends.

strayed to a varied trade, representing diverse careers  
freeds. Saturday drew the best crowd. All were  
aware of fewer cares, less fatigue. There we saw  
battered bizzars who bragged of "bracers" served at  
see meal of beef stew and cabbage. A better fare  
those reared on earth's greater awards.

⇒ Typists fingers travel: 30 km → 1.5 km/day.

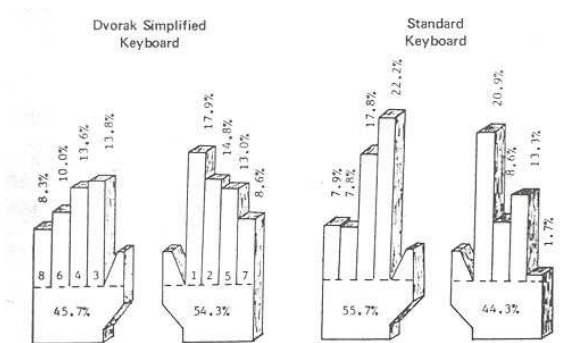
# More Work on Home Row: Illustration





# Better Finger Loads

- Numbers: 1-best, 8-weakest.
- Finger loads according to relative finger capabilities.



In this figure, the lengths of the fingers are proportional to the work each one does. Notice how the DSK evens up the finger loads.

- 1933: Dvorak started entering typists
  - trained on DSK,
  - into the International Commercial Schools Contest.
- 1934-1941: 10× won their class events.
- 1935: 9 Dvorak typist = 20 medals.
- Qwerty typists:
  - do not want to sit be placed next to Dvorak's typist,
  - disconcerting noise [too fast typing speed:)].

# Experimental Results

- Easier to learn.
- Easier to operate (less fatiguing  $\Leftarrow$  simpler strokes).
- More accurate (50% fewer mistakes)
- Faster:
  - several records,
  - improves productivity by 35%-100%.

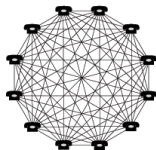
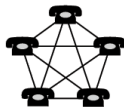
- Midst of the Great Depression (+World War II).
- “Unbiased” test by Earl Strong:

“I have developed a great deal of material on how to get this increased production on the part of typists on the standard keyboard. Consequently, I am not in favor of purchasing new (i.e., Dvorak) keyboards and retraining typists on the new keyboard, and I am out to exploit it to its very utmost in opposition to the change to new keyboards. ” (1949)

- U.S. General Services Administration, 1956
- later interestingly destroyed.

# “Contra-2”

- Qwerty: became entrenched in tradition.
- Network effect (economics):



- New typists start with Qwerty:  $\exists$  DSK?
- Retraining requires:  $\approx$  1 month (lower productivity).

- Qwerty keyboard:
  - designed for mechanical typewriters.
- An alternative (DSK): emphasis on
  - typist comfort,
  - high productivity,
  - ease of learning.
- Available on all major platforms:
  - Linux, Mac OS X,
  - even on Windows.

# Some Other Alternatives/Approaches

- Many ergonomically “deformed” keyboards:



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- Typewriter is available on iPad:





Thank you for the attention!



# Blank Keyboards



- 60 pages: discuss keyboards,
- 15 pages: mention Dvorak's simplified keyboard,
- Rest is dedicated to:
  - study of behavior, language,
  - learning patterns, fatigue, and
  - other general concepts (useful to all typists).

Frank Edward McGurrin:

- court stenographer (Salt Lake City, Utah),
- decisive victory in a typing contest:
  - with touch typing,
  - July 25, 1888 (Cincinnati).
- won \$500 USD ( $\approx$  \$13,000 USD today).