

# An Implementation of the TRON Keyboard

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## **ABSTRACT**

Two important objectives of keyboard input method are to gain speed and to lessen the fatigue of operators. The TRON keyboard layout is based on the data of the physical size of hands of Japanese. Firstly, physical placement of keytops which are easy to strike and causes less fatigue was determined using the data. Secondly, character frequencies in real documents was used to decide the final location of each character in the keyboard. In addition, an electronic pen is proposed for figure input.

Oki Electric Industry Co., Ltd. has built a TRON keyboard prototype on the basis of the TRON keyboard specifications. This paper discusses the design of the keyboard that reflects the TRON specifications for its implementation as a product.

**Keywords:** Input Device, Keyboard, Finger's Reach, Electronic Pen

## **1. TRON KEYBOARD DESIGN PHILOSOPHY**

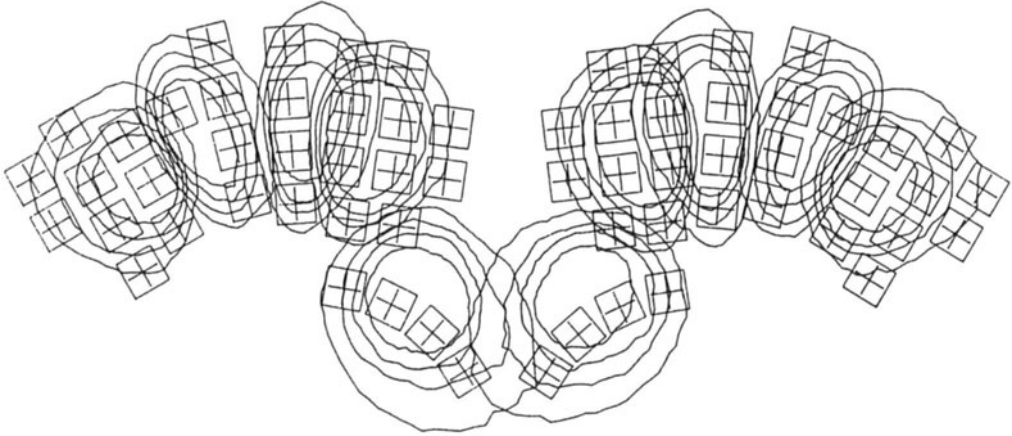
The paper [1] describes the design philosophy on the TRON keyboard in detail. This chapter describes its fundamental philosophy.

### **1.1 KEY LAYOUT**

The TRON keyboard has a key layout based on measured data of the extent in which typical Japanese people can move their fingers, i.e., the "finger's reach." The data were collected from about 150 Japanese men and women 20 to 60 of age.

Each of the people tested had each of his/her fingers rested in the center of a key on a keyboard in its home position indicated on a jig, with the thumb and wrist fixed. The extent of each finger's reach was traced. Then the trace of the finger was digitized and extents of finger's reach grouped by percentage of the people tested were defined using

contour lines. The 64 keys, beside a cursor key, required by the TRON keyboard were laid out to ensure that all of them should be accommodated toward the center of the trace. The key layout thus determined is shown in *Fig. 1*. The traces drawn in contour lines indicate extents of finger's reach by percentage of the samples: from the inner side, 80%, 60%, 40%, and 20%.



*Fig. 1 Layout of TRON Keyboard*

*Table 1* shows measured data of the distance from the wrist to the tip of the middle finger (hand length). The difference in hand length between maximum and minimum is 51.5 mm; one size alone cannot offer a keyboard which matches all human hands. The TRON keyboard comes in three different sizes, S, M and L, to choose from according to the size of hands.

*Table 1 Hand Length Data (in mm)*

	Men	Women	Both
Average	194.2	178.9	189.5
Standard deviation	10.6	8.2	12.2
Maximum	218.0	200.0	218.0
Minimum	171.5	166.5	166.5

Consider the spacing between the forefinger and the middle finger in their home position as an example of analyzing the three different sizes. According to the measured data, the