DESIGN OF THE HAND

by

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The following scheme for designing a general-purpose manipulator organ has many theoretical attractions. The basic idea is perhaps best conceived as a theoretical, or mathematical, idea. While it is unlikely that the actual system will be very much like it, it may have value as a sort of ideal against whose elegance we can match engineering and practical compromises.

The device is built up of rods, connected by two kinds of joints, L and Y. An L-joint is a sort of elbow, or L-bow:

\[ \theta_A \]
\[ \theta_R \]

with two degrees-of-freedom, one axial and one rotary.

A Y-joint is a branch, or fork:

composed of two L-joints and a rotating Y-piece.
Engineering realism may dictate simplifying the Y-joint, as discussed below.

Our design for the system is based on a binary branching and dimension scheme, that forms a jointed tree as follows: let \( L \) be some unit of length:

Thus, the scheme alternates \( L \)'s and \( Y \)'s; the dimension-scale is halved after each \( Y \)-joint.

Note how the system, magically, forms the essentials of the human body:
One gets a configuration for the hand that has, apparently, all
the virtues of palm fingers, and thumb, but more versatility.

**ADVANTAGES:** Uniform design of joints - one technology,
Different sizes.
Uniformity of programming.
Modular system.

Note how the system can be used over a wide range of task
sizes, by selecting the parts used in each application:

Thus the same programs and methods can be used at each
size scale.