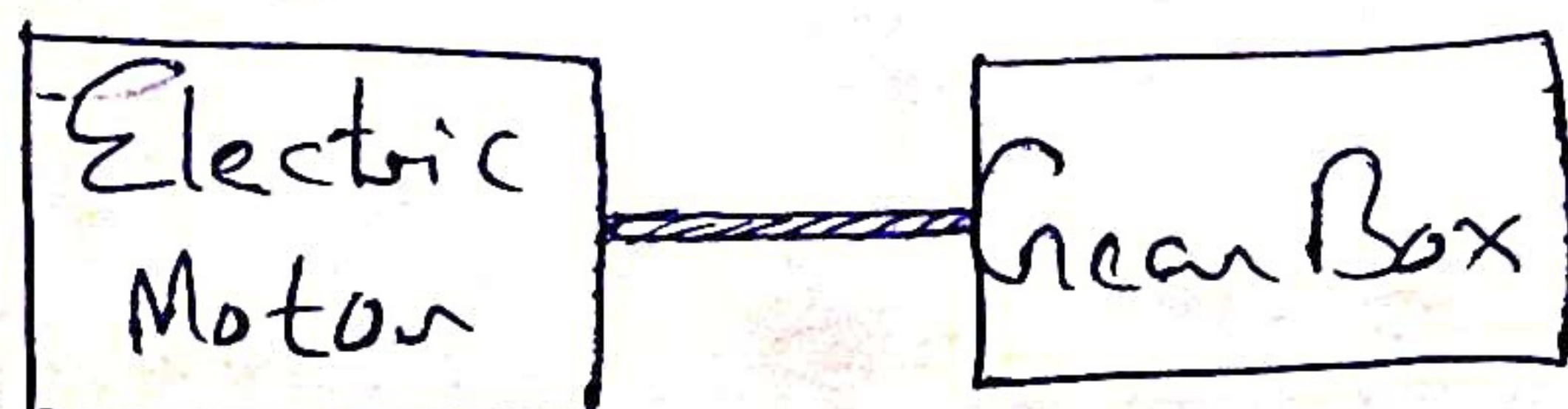


2

Let's get you a Robot

Arm \rightarrow iiwa (by KUKA)

Hand \rightarrow wsg



\rightarrow heavy
 \rightarrow Spin fast

\rightarrow Big gear box
huge friction
 \rightarrow Backlash

\Rightarrow Big Gear Box \equiv No force Control

Direct-Drive Robots

$\left\{ \begin{array}{l} \text{You can do Position} \\ \text{Velocity control} \end{array} \right\}$

\rightarrow Joints directly connected to electric motor (i.e. no gearbox)

iiwa

\rightarrow roughly 1:100 gear ratio

\rightarrow Position sensor + **Strain gauge** on joints
(for measuring torque)

Drake's Physics Engine

\rightarrow Multibody Plant