

Force Control for Robotic Manipulators

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At present robots are playing an important role in several industries to promote higher productivity. However, their applications are still limited to operation without contacting with environment. Such an operating scheme is called position control. Some successful industrial applications using this scheme include spray painting and pick-n-place tasks.

In fact, many automated manufacturing processes, require robots to interact with environment and to perform force/moment interaction such as mechanical assembly. This research aims to study the dynamic force/moment, acting on the workpieces during part assembly. Importantly, impact forces occur while parts being contacted. We are searching ways to reduce this impact force to enhance stability. At Center of Operation for Field roBotic Development (FIBO), an ABB industrial robot is used as a test bed for this research as shown in Figure 1. We have also designed two versions of force sensors.

In addition, we have begun the preliminary study of a one prismatic D.O.F. robot under force control depicted in Figure 2. The result on simulation of this model indicates the effect of varying parameters to robot performance.

The objectives of this research are as follow:

- 1.To study the relationship between end-point forces and control effort.
- 2.To study a dynamic model of an industrial robot.
3. To design a control system that can reduce impact forces.
4. To increase the performance of robot

Analytical results from this research will establish a solid foundation of understanding in robotic force control and can be applied to real industrial robots such that they can effectively and successfully perform assembly operation.



Figure 1 An industrial robot connected with a FIBO force sensor.

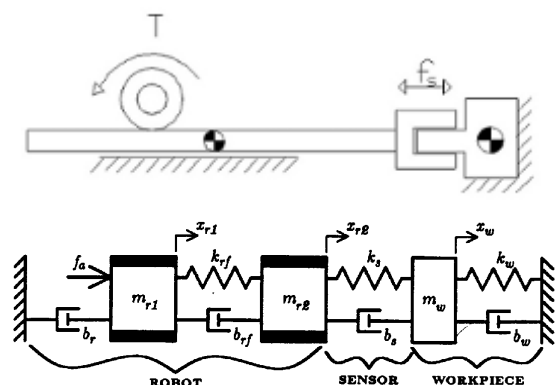


Figure 2 A lumped model of one prismatic D.O.F robot