

Image Guided Motion of a Humanoid Robot

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R&D in robotics has been focused in the area of fixed robots in order to promote higher productivity in manufacturing industry. However, there are several exploring tasks that these fixed robots cannot perform. Mobile robots, having mobility performance, are currently being studied and researched by many leading academic institutions around the World e.g. M.I.T., Harvard, Stanford and Waseda University. In addition, Honda, one of the largest automobile manufacturers, has been spending more than billion yens in developing a series of two-legged humanoid robots. Legged robots have greater advantage and dexterity, compared to wheeled robots when rough terrain exploration is required.

The Institute of Field roBOTic (FIBO) at King Mongkut's University of Technology Thonburi realizes the significance and impact of new technology associated with the development of a humanoid robot. Examples of such technology are real-time three dimensional balancing of dynamically unstable system, vision system and artificial intelligence. The analytical parts of this research will be devoted to the extension of the Kane's dynamics theory, ZMP, Gravity Reaction Force and Conservation of Energy. The stability of walking motion will be enhanced through the use of visual information. In addition, we will design a novel, omnidirectional leg mechanism and installed them in our humanoid prototypes.

Our research plan is as follow:

1. Study the theory of Biomechanics to determine an optimum design of a humanoid robot prototype.

2. Perform research on the mobility and the dexterity of a humanoid robot prototype.
3. Design a control systems, passive real time and active real time of D.C. servo motors.
4. Integrate a vision system to determine advance postures and trajectories of a robot by using artificial intelligence theory.



Figure 1. A first prototype of a two-legged walking robot.

We are currently implementing the kinematic and dynamic motion to the real robot as show in Figure 1. Our humanoid robot is considered the first prototype of its kind in Thailand. FIBO is committed to initiating and disseminating new technology for higher productivity. The outcome of this research will again prove that high performance automation systems could be achieved by thoroughly understanding the fundamental knowledge.