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## A23 Algebraic Specifications an a Communication Medium

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One key task in the software development is the so-called requirements analysis/specfication. During this phase, software developers dialogue with customers so as to specify the intended software's functionalities. The problem is that software developers only have a limited knowledge of the customer's field (e.g. no knowledge of medicine while developing a life support monitoring software) while the customer has only limited knowledge of computers. There is a communication gap. To bridge this communication gap one uses mainly natural language. Unfortunatly, natural language has many pitfalls of which ambiguity is not the least.

We advocate algebraic specifications as a way to bridge the communication gap between customers and software developers.

Algebraic specifications are mathematically sound, providing the developers with a powerfull tool and a way of communication between themselves. Algebraic specifications are high-level. Algebraic specifications can be made executable providing the developers with a prototyping tool so that they can show the behaviour of the intended software to the customer.

This reasons lead us to believe that algebraic specifications are a wellsuited tool to provide software developers and customers with a communication medium.

## A24 A Study of Friction and Wear of Artificial Joint Materials

Hidehisa SHIMANOUCHI and Teruo MURAKAMI Department of Mechanical Engineering, Faculty of Engineering, Kyusyu University 'Artificial Joints' i.e., joint prostheses are applied for handicapped people who have damaged hip or knee joint. Though they have been progressively used for about 30 years and now over 500,000 replacement operations are carried out a year in the world, there are various ploblems on it because of its design, materials and so on. So some people suffer from loosening and wear. To get rid of these ploblems, which are concerned with 'tribology', the authors go forward with many investigations.

On the friction surface of an artificial joint, a pair of metal (ex. Co-Cr-Mo alloy) or ceramics and ultrahigh moleculer weight polyethylene are used. In certain case they go into a poor condition such as high friction or high wear because these materials directly contact each other under high loading and slow sliding speed conditions.

In the present study, the sliding pairs of convex polyethylene or PVA (polyvinyl alcohol) gel roller and flat glass plate were used to directly observe the rubbing surfaces.

The PVA gel is a candidate biomaterial as an artificial articular cartilage, which includes water in it. The compliant PVA gel showed higher friction than polyethylene. This is partly attributable to excessive deformation in this geometrical combination.

## A25 Performance Evaluation of Joint Prostheses in a Knee Joint Simulator

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Several hundreds thousands of total joint replacement operations especially for diseased hip and knee joints are now carried out each year in the world. However, in certain cases, serious tribological problems such as joint loosesing and wear have occured.

To investigate the frictional behavior and the lubricating film formation in knee prostheses, a knee joint simulator was used to simulate the tibial