Walking pattern of crippled child is measured and recorded without the inhibiting tangle of wires through a spinoff of space telemetry. Step-sensors in soles of shoes and miniature radio transmitters send signals to receiver without wires.

Gait analysis laboratory

A complete motion-analysis laboratory has evolved out of analyzing the walking patterns of crippled children at the Stanford Children's Hospital, Pala Alto, Calif. The technology used in the laboratory was spun off from techniques developed for space telemetry.

Ames Research Center adapted biotelemetry to monitor the awkward, jerky gait of cerebral-palsied children, thereby eliminating the previously necessary long bundle of wires leading to recording equipment. Children often were inhibited by the tangle of wires and electrodes attached to their bodies, thus distorting the readings. Biotelemetry—or radio transmission such as that used to monitor astronauts' bodily functions in space—eliminates the need for wires from patient to recorder.

In order for corrective therapy to be effective, precise knowledge of how each muscle group contributes to the child's walking problem is required. The Stanford hospital now collects the data by placing tiny electrical sensors over the muscle groups of a child's legs and inserting step-sensing switches in the soles of his shoes. Miniature radio transmitters then send signals to a receiver for continuous recording of his abnormal walking pattern.

The system has proved useful in evaluating benefits that might be produced by muscle- and tendon-lengthening operations. It also helps determine whether medications may improve a patient's mobility by decreasing muscle spasms.

The work has helped the Stanford Children's Hospital to become a regional center offering motion analyses of patients referred from northern and central California.

Nearby NASA engineers at Ames are working to apply space-electronics miniaturization techniques to reduce the size and weight of the telemetry system further. They also are striving to increase the signal bandwidth so analyses can be performed faster and more accurately using a mini-computer.

Breast cancer detection

While ultrasonic imaging is under development at NASA to replace X-rays in many applications, commercial development and widespread usage will take several years at best. Meanwhile, Jet Propulsion Laboratory scientists have come up with another technique to decrease exposure to harmful X-rays, especially in mammography, or breast radiography.

Typically, physicians make more than one exposure to arrive at an X-ray film of acceptable density. Now the same solar cells used to convert sunlight into electricity on space satellites can make a single exposure suffice.

The cells are sensitive not only to light, but to X-rays as well. Very low-energy X-rays are used in mammography since the breast contains no bone and is transparent to X-rays. When several small solar cells are connected electrically so their output is additive, they can sense extremely small amounts of X-ray energy. Placing a fluorescent material in contact with their surface increases sensitivity even further.

When the solar cell sensor is positioned directly beneath the X-ray film, it can determine exactly when the film has received sufficient radiation and has been exposed to optimum density. At that point, associated electronic equipment sends a signal to cut off the X-ray source.

The NASA laboratory recently tried this control system at the Huntington Memorial Hospital in Pasadena—with overwhelming success. The reduction of mammography to single exposures not only reduced the X-ray hazard significantly, but doubled the number of patient examinations handled by one machine. Through a Technology Utilization Office applications engineering project, NASA now is attempting to transfer this technology to the X-ray industry. The attempt is to modify existing equipment to take advantage of the solar sensors.