

# Head-mounted Impact Acceleration Measurement System.

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## ABSTRACT

The system measures impact accelerations imparted to a boxer's head during a boxing bout.

The system is comprised of three major subsystems:

- 1) The acceleration data transmitter located on the boxer's body.
- 2) The receiving and storage subsystem.
- 3) The data processing subsystem.

The transmitting subsystem includes a special skull cap fitted with an array of nine accelerometers. The accelerometers are connected to a "body pack" located on the boxer's waist. The body pack houses signal conditioning amplifiers and nine channels of FM/FM modulation divided into one four channel and one five channel multiplexed transmitters.

The data transmitted from the boxer is received at the ringside and demodulated. A special threshold detector then triggers analog-to-digital conversion process when the received acceleration data exceeds a predetermined level. The acceleration data is digitized at the rate of 5,000 samples per second. The digitized data for each blow is stored in the random access memory and the accumulated data for each round is transferred to hard disk after the round.

The data collected during the bout is processed after the bout to determine linear acceleration (x,y, and z coordinates), and angular acceleration (about x,y, and z axis) for each blow. The results are stored on a floppy disk to be available for further analysis.

The data acquisition, storage, and processing is done by an IBM-PC/AT compatible computer equipped with two megabytes of memory, two floppy disk drives, a hard disk, and a high speed data acquisition board.