

Air mattress type bio-signal and sleep monitoring system

Air mattress type bio-signal monitoring system was developed by Hosei University Watanabe Lab. and JEPICO corp. with business-academia collaboration. Just lying down on the air filled mattress enables detecting the several bio-signals such as heart beat, respiration, body movement and snoring.

Furthermore, by measuring and analyzing the bio-signals of person being tested during sleep, we can speculate the sleep stage between awakening and non-REM in total 6 stages, and we can detect the disorder of sleep. This equipment is incomparable as a non-restraint measuring system, and it is capable of wide application. For example, it is considered that this equipment should be adapted to monitor of an astronaut's bio-signals and sleeping conditions.

Since the astronaut has to spend in space for extended period of time in space station quarter, if the bio-signals and sleeping data of astronaut spent in space are collected and analyzed, they will be useful for civilian travel in space.



Non-restraint
Measuring system

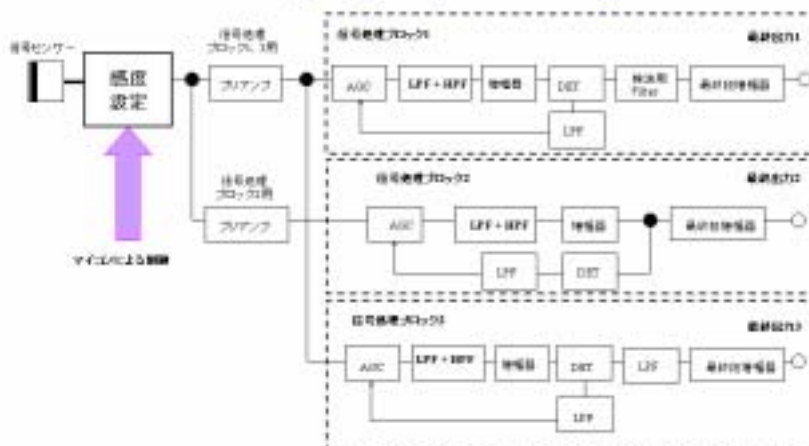


Air mattress
High sensitive pressure sensor
Hardware box

Block Diagram

Air mattress type bio-signal monitoring system is composed of high-sensitive pressure sensor, sensor signal processing LSI and signal processing software and so on. Above all high-sensitive pressure sensor is capable of high sensitivity detecting 1ppm of air pressure. As the filter dividing mixed bio-signals are made of gyrator, we can apply the highest performance and the most accurate devices to ultra low frequency signal processing of typical bio-signal.

Block Diagram of Sensor interface and Analog signal processing



Air Mattress

Air mattress for the detection of bio-signal is workable even under the bottom mattress or bed. As only air is charged, it has no affect on the human body

Pressure Sensor

High sensitive pressure sensor of our own improving can detect ultra low frequency bio-signals.

Hardware Box



Automatic Sensor Gain Adjustment

The sensitivity of pressure sensor can be set to the most appropriate stage in the total 16 stages automatically.

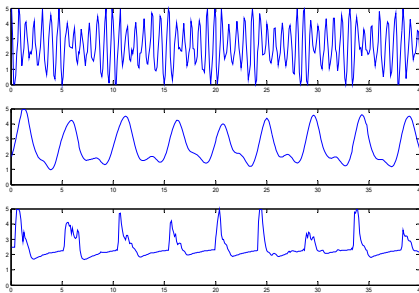
Digital Signal Processing

After divided into several bio-signals by our original LSI, CPU transforms them to heart beat, respiration, snoring, body movement and sleep stages.

Analog and digital board



Bio-signals



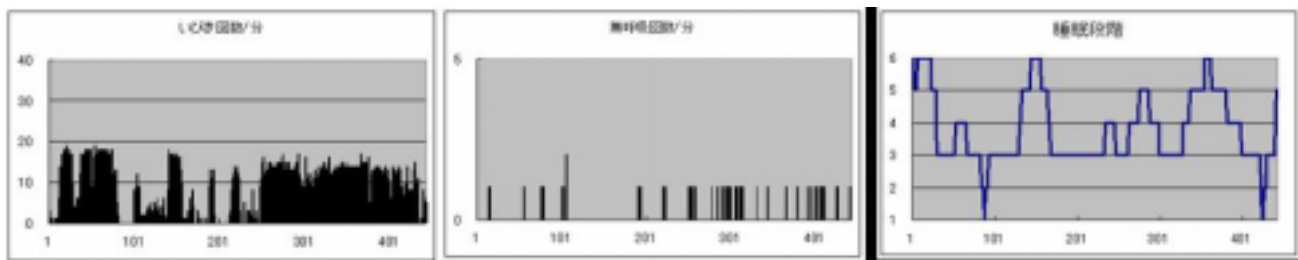
Heart Beat

Respiration

Snoring

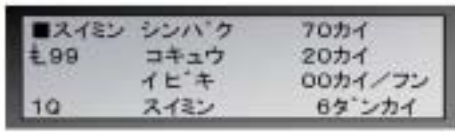
Sleep Monitoring Functions

Accumulated and analyzed sleeping data



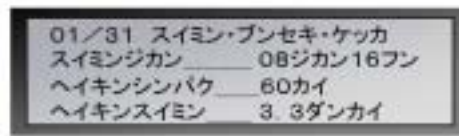
By measuring and analyzing the bio-signals of person during sleep, the sleep stage between awakening and non-REM in total 6 stages can be speculated.

Sleep monitoring



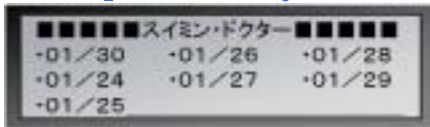
Sleep stage per a minute can be displayed.

Sleep Analysis

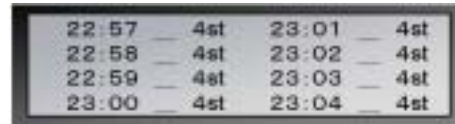


On rising, final sleep stages through the night can be determined.

Sleep Data Analysis

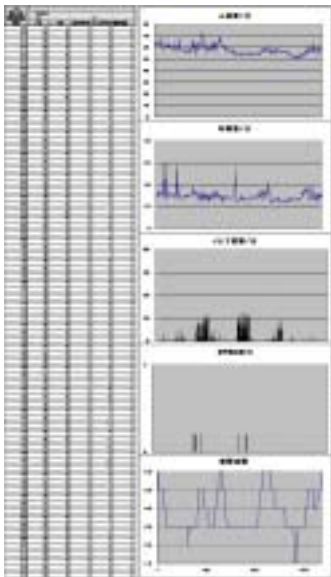


Select date



Data of sleep stages per a minute can be accumulated up to maximum 7 days.

Data communication function



By serial communication function, sleep data of maximum 7day's heart beat, respiration, snoring, sleep apnea and sleep stage can be extracted to Excel data sheets of PC.

Sleep point rating function



By point rating function, sleeping time, snoring condition, sleep quality and depth of sleep can be rated.

Development Profile

- Year 2002 Working prototype was developed (Japanese TV program covered our system)
- Year 2003 Sensor, hardware and software algorithm were improved and upgraded.
- Year 2004 Downsized(2 name card size), in-car system, networked system , deferential system for harsh environment were performed.

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