Structural Health Monitoring (SHM)
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Lecture - 72
SHM design for BSLRP-Part 2

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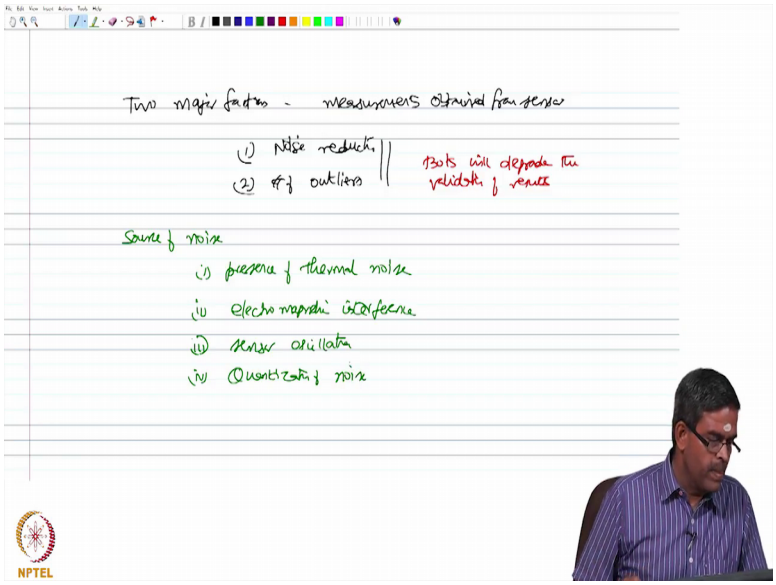

So, in the proposed design of SHM-2 which we are discussing at the moment, these effects are reduced, ok.

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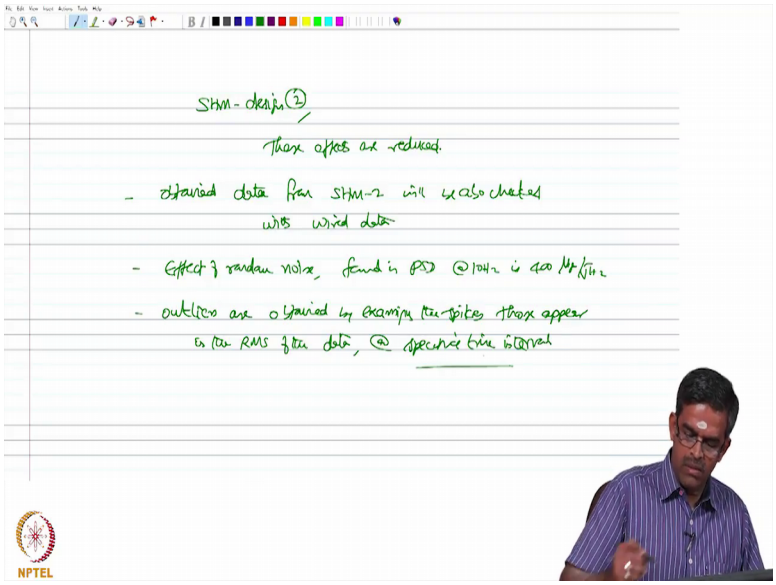

Further, the obtained data by SHM-2 will be also checked with the wired data for its accuracy. One can also see from the previous results of the last lecture, the effect of random noise which is found in the power spectral density function at 10 hertz is about 400 root z.

So, the outliers are obtained by examining the spikes, those appear in the RMS level of the data at specified time interval that is very interesting, you can easily make out that ok.

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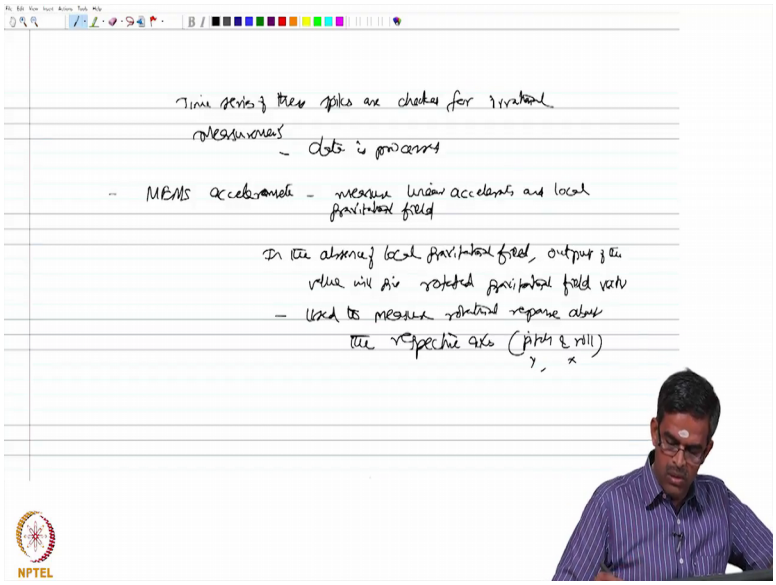

Time series of these spikes are checked for irrational measurements and then the data is processed. Friends, we also note that we are trying to measure two types of measurements. MEMS accelerometers also has modules to measure the rotational response, they will measure linear acceleration. And the local gravitational field in the absence of the local field, output of the value will give the rotated gravitational field vector which can be used to measure rotational response about the axis maybe pitch and roll which is about the y axis and roll is about the x axis.

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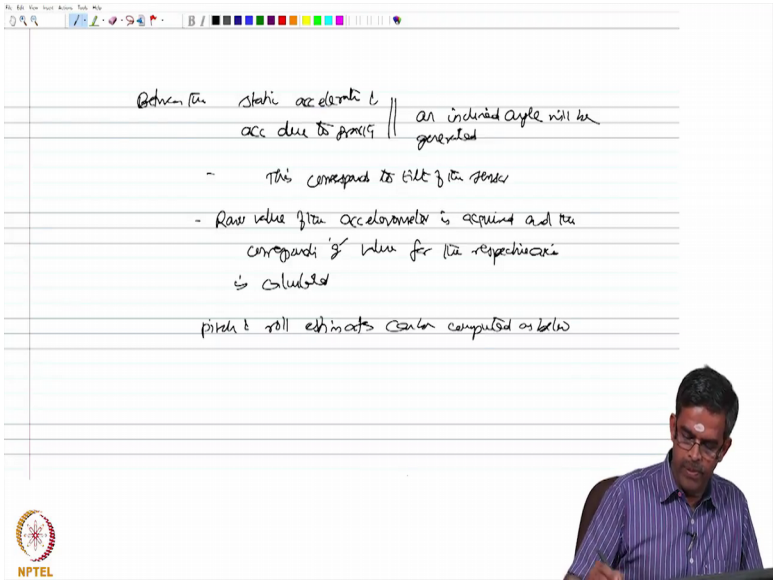

So, between the static acceleration and acceleration, due to gravity, an inclined angle will be generated this corresponds to tilt of the sensor, raw value of the accelerometer is acquired and the corresponding g value for the respective axis is calculated. So, pitch and roll estimates can be computed as below.

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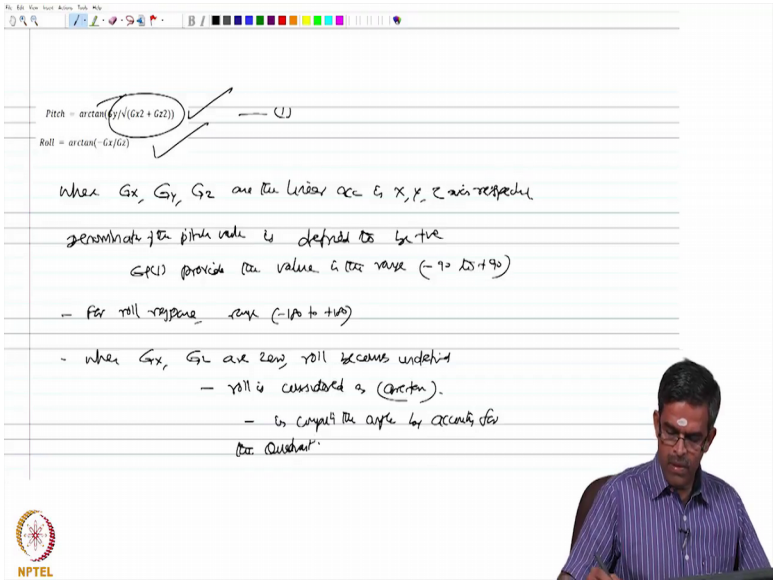

Which is equal to this equation and roll is given by this equation where Gx, Gy and Gz are the linear acceleration in x, y and z axis respectively, denominator of the pitch value that is this value is defined to be positive and therefore, equation 1 provide the full value

in the range minus 90 to plus 90 for role response, the range will be minus 180 to plus 180. Now, when Gx and Gy, sorry, Gx and Gz are 0, roll becomes undefined. In order to overcome this problem, roll is considered as a function of arctan, ok. This eliminates the ambiguity in computing the angle by accounting for the quadrant.

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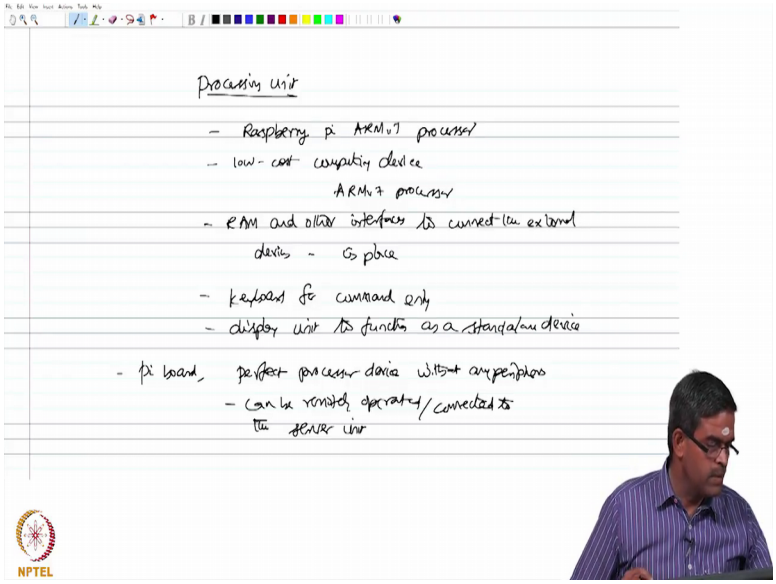

Let us see, what is the change? We had in the processing unit. The processing unit is raspberry pi ARM v 7 processor. This is a low cost computing device which has ARM v 7 processor, the random access memory and other interfaces that are required to connect the external devices or also in place in the processing unit. This also needs a keyboard for command entry it also needs a display unit to function as a standalone device. Thus, the p i board presently used for the system acts as a perfect processor device without any peripherals and can be remotely operated to the server unit.

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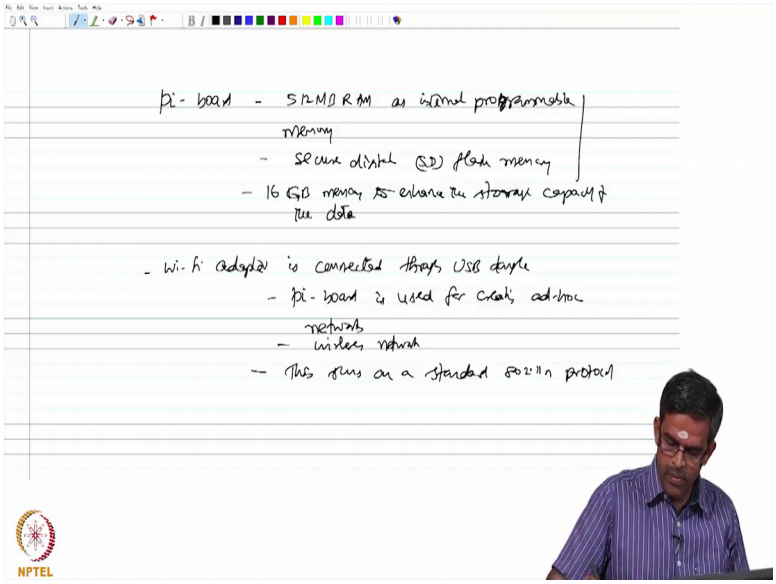

The pi board also has a 512 MB RAM as internal programmable memory and a secure digital flash memory in the processing board one can also use an extended 16 GB memory to enhance the storage capacity of the data. Now, the Wi-Fi adapter is also connected through USB dongle with the help of which the board is used for creating adopt networks and to connect wireless network. This runs on a standard mode 80211 n protocol as a computing device.

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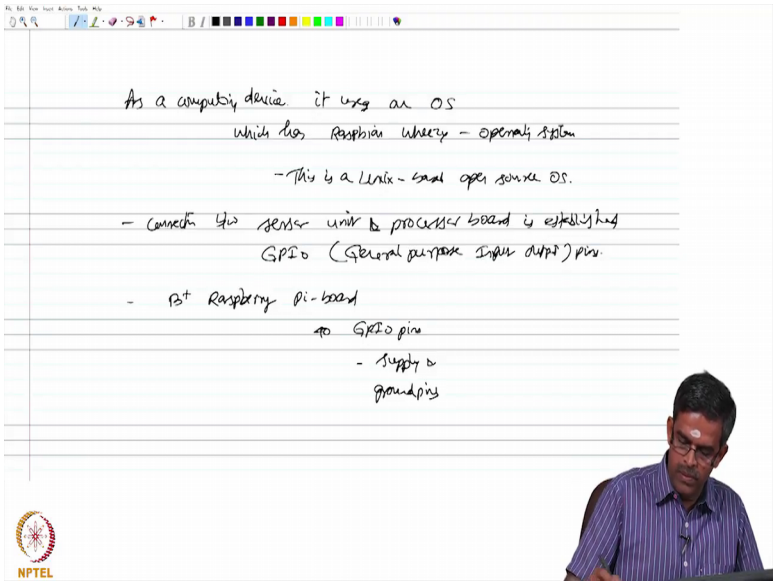

It uses an operating system which has Rasphian vz as the operating system, this is the Linux based open source operating system.

Now, the connection between the sensor unit and the processor board is established through the GPIO that is general purpose input output pins, the board used in the present studying which is B plus raspberry pi board has forty GPIO pins which includes the supply and the ground pins.

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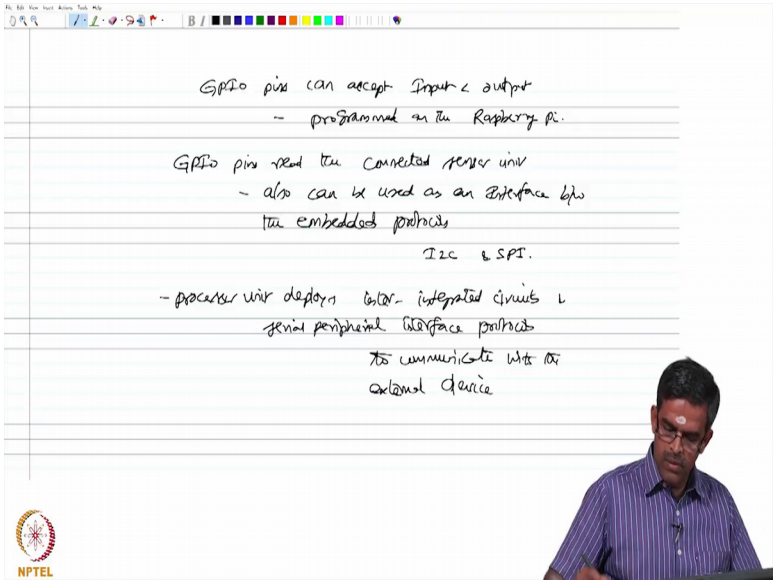

The GPIO pins can accept input and output and can be thus programmed on the Raspberry pi the GPIO pins read the connected sensor unit. And also can be used as an interface between the embedded protocols like I 2 C and SPI. The processor unit deploys inter integrated circuits and serial peripheral interface protocols to communicate with the external device.

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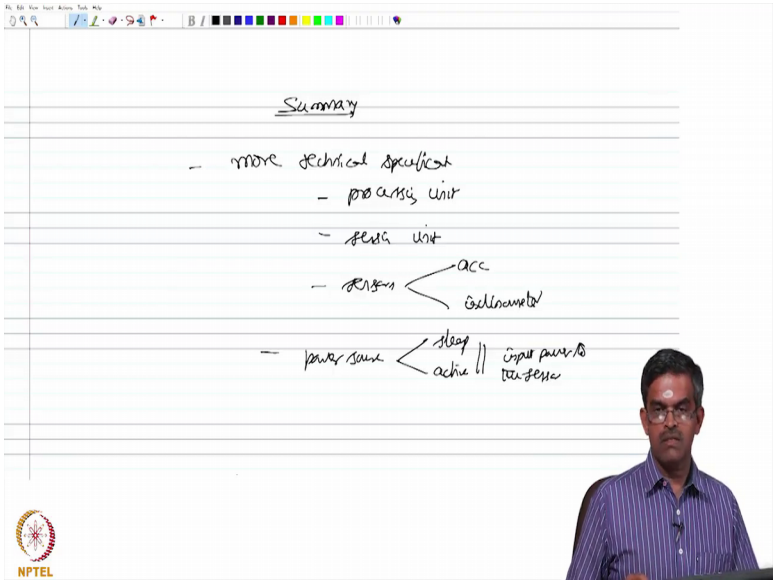

So, friends, in this lecture, we saw more technical specifications of the processing unit of the sensing unit, we also saw how the sensors can be used x accelerometer and inclinometer. We also learnt; how to save the power source maybe in the sleep mode or in the active mode by controlling the input power through the sensing units.

We will discuss further details about this and the interface programming required to acquire the data using wireless sensor SHM 2 design in the next lecture as well.

Thank you very much and bye.