Цели: Активизировать в речи учащихся использование новой лексики, связанную с датчиками.

Задачи:

1) читать текст с пониманием основного содержания

2) воспринимать текст на слух, добиваясь в случае необходимости понимания с помощью переспроса, уточняющих реплик;

3) повторение грамматического материала множественное число существительных.

Тип урока: Обяснение новой темы

Оборудование: ИКТ, лекция соответствующая содержанию урока

Procedure of the lesson:

Task 1. Translate the following word-combinations into Russian.

A physical quantity, expansion, contraction, calibrated glass tube, a thermocouple, touch sensitive elevator buttons, dim, brighten, MEMS technology, sensitivity, deviation, linear,

Read and translate the text. Sensors.

A sensor is a device that measures a physical quantity and converts it into a signal which can

be read by an observer or by an instrument. For example, a mercury thermometer converts the

measured temperature into expansion and contraction of a liquid which can be read on a calibrated glass tube. A thermocouple converts temperature to an output voltage which can be read by a voltmeter. For accuracy, all sensors need to be calibrated against known standards.

Use

Sensors are used in everyday objects such as touch-sensitive elevator buttons and lamps

which dim or brighten by touching the base. There are also innumerable applications for sensors of which most people are never aware. Applications include cars, machines, aerospace, medicine, manufacturing and robotics.

A sensor's sensitivity indicates how much the sensor's output changes when the measured

quantity changes. For instance, if the mercury in a thermometer moves 1 cm when the temperature changes by 1°C, the sensitivity is 1 cm/°C. Sensors that measure very small changes must have very high sensitivities. Sensors also have an impact on what they measure; for instance, a room temperature thermometer inserted into a hot cup of liquid cools the liquid while the liquid heats the thermometer. Sensors need to be designed to have a small effect on what is measured; making the sensor smaller often improves this and may introduce other advantages. Technological progress allows more and more sensors to be manufactured on a microscopic scale as micro sensors using MEMS technology. In most cases, a micro sensor reaches a significantly higher speed and sensitivity compared with macroscopic approaches.

Sensor deviations

If the sensor is not ideal, several types of deviations can be observed:

The sensitivity may in practice differ from the value specified. This is called a sensitivity

error, but the sensor is still linear.

Since the range of the output signal is always limited, the output signal will eventually reach a

minimum or maximum when the measured property exceeds the limits. The full scale range defines the maximum and minimum values of the measured property.

If the output signal is not zero when the measured property is zero, the sensor has an offset or

bias. This is defined as the output of the sensor at zero input.

If the sensitivity is not constant over the range of the sensor, this is called nonlinearity.

Usually this is defined by the amount the output differs from ideal behavior over the full range of

the sensor, often noted as a percentage of the full range.

If the deviation is caused by a rapid change of the measured property over time, there is a

dynamic error. Often, this behavior is described with a bode plot showing sensitivity error and

phase shift as function of the frequency of a periodic input signal.

If the output signal slowly changes independent of the measured property, this is defined as

drift.

Long term drift usually indicates a slow degradation of sensor properties over a long period of

time.

Noise is a random deviation of the signal that varies in time.

Hysteresis is an error caused by when the measured property reverses direction, but there is

some finite lag in time for the sensor to respond, creating a different offset error in one direction

than in the other.

If the sensor has a digital output, the output is essentially an approximation of the measured

property. The approximation error is also called digitization error.

If the signal is monitored digitally, limitation of the sampling frequency also can cause a

dynamic error.

The sensor may to some extent be sensitive to properties other than the property being

measured. For example, most sensors are influenced by the temperature of their environment.

All these deviations can be classified as systematic errors or random errors. Systematic errors

can sometimes be compensated for by means of some kind of calibration strategy. Noise is a

random error that can be reduced by signal processing, such as filtering, usually at the expense of

the dynamic behavior of the sensor.

Types

1. Acoustic, sound, vibration

2. Automotive, transportation

3. Chemical

4. Electric current, electric potential, magnetic, radio

5. Environment, weather

6. Flow

7. Ionizing radiation, subatomic particles

8. Navigation instruments

9 .Position, angle, displacement, distance, speed, acceleration

10. Optical, light, imaging

11. Pressure, force, density, level

12. Thermal, heat, temperature

13. Proximity, presence

14. Sensor technology

Vocabulary:

sensitivity – восприимчивость

full scale range – полномасштабный диапазон

bias – смещение, наклон, уклон

behavior – поведение

a Bode plot – график Бодэ

phase shift – изменение фазы

drift – смещение

random – случайный, произвольный, беспорядочный

lag – задержка, отставание

Task 2. Ask questions to the underlined words.

1. A sensor is a device that measures a physical quantity.

2. A sensor converts it into a signal which can be read by an observer or by an instrument.

3. A thermocouple converts temperature to an output voltage which can be read by a voltmeter.

4. Sensors are used in everyday objects such as touch-sensitive elevator buttons and lamps

which dim or brighten by touching the base.

5. A sensor's sensitivity indicates how much the sensor's output changes when the measured

quantity changes.

6. Sensors need to be designed to have a small effect on what is measured.

7. Technological progress allows more and more sensors to be manufactured on a

microscopic scale as micro sensors using MEMS technology.

8. The sensitivity may in practice differ from the value specified. This is called a sensitivity error.

9. The full scale range defines the maximum and minimum values of the measured property.

10. If the deviation is caused by a rapid change of the measured property over time, there is a

dynamic error.

Task 3. Restore the sentences.

1. A thermocouple convert’s temperature to \_\_\_\_\_which can be read by a voltmeter.

2. In most cases, a microsensor reaches \_\_\_\_\_and sensitivity compared with macroscopic

approaches.

3. If the output signal is not zero when the measured property is zero, the sensor has \_\_\_\_\_ .

4. If the sensitivity is not \_\_\_\_\_over the range of the sensor, this is called\_\_\_\_\_.

5. If \_\_\_\_\_slowly changes independent of the measured property, this is defined as\_\_\_\_\_.

6. If the sensor has\_\_\_\_\_, the output is essentially an approximation of the measured property.

7. If the signal is monitored digitally, limitation of \_\_\_\_\_also can cause \_\_\_\_\_ .

8. The approximation error is also called\_\_\_\_\_.

9. \_\_\_\_\_can sometimes be compensated for by means of some kind of \_\_\_\_\_strategy.

10. Noise is \_\_\_\_\_that can be reduced by signal processing.

Task 4. Translate into English.

1. Датчик, сенсор — термин систем управления, первичный преобразователь, элемент

измерительного, сигнального, регулирующего или управляющего устройства системы,

преобразующий контролируемую величину в удобный для использования сигнал.

2. В настоящее время различные датчики широко используются при построении

систем автоматизированного управления.

3. Датчики являются элементом технических систем, предназначенных для

измерения, сигнализации, регулирования, управления устройствами или процессами.

4. Датчики преобразуют контролируемую величину (давление, температура, расход,

концентрация, частота, скорость, перемещение, напряжение, электрический ток и т. п.) в

сигнал (электрический, оптический, пневматический), удобный для измерения, передачи,

преобразования, хранения и регистрации информации о состоянии объекта измерений.

5. Обобщающий термин датчик укрепился в связи с развитием автоматических

систем управления, как элемент обобщенной логической концепции датчик — устройство

управления — исполнительное устройство — объект управления.

6. Понятие датчика по практической направленности и деталям технической

реализации близко к понятиям измерительный инструмент и измерительный прибор, но для этих устройств преобладает аспект их использования человеком, а датчики, как правило, используются в автоматическом режиме.

Task 5. Write down the following nouns in plural:

A star, a mountain, a tree, a waiter, the queen, a man, a woman, an eye, a shelf, a box, a city, a boy, a goose, a watch, a mouse, a dress, a toy, a sheep, a tooth, a child, an ox, a deer, a life, a tomato.

Task 6.Write down the following nouns in plural:

this man, that match, this tea-cup, this egg, that wall, that picture, this foot, that mountain, this lady, that window, this knife

Task 7. Put the following sentences in plural and write them down. Pay attention to the changes of the verb (глагол):

1. A new house is in our street. 2. This story is very interesting. 3. There was a woman, a man, a boy and a girl in the room. 4. In the farm-yard we could see an ox, a sheep, a cow and a goose.

5. Put this knife on that table. 6. Why don't you eat this potato? 7. This strawberry is still green.

8. A yellow leaf has fallen to the ground. 9. Can you see a bird in that tree? 10. Does your tooth still ache? 11. I held up my foot to the fire to warm it. 12. His child studies very well. 13. Is this worker an Englishman or a German? — He is a Frenchman.

Task 8.Put the following sentences in plural and write them down. Pay attention to the changes of the verb:

1. This is my stocking. 2. He has a new suit. 3. This metal is very hard. 4. That ship is a Russian one. 5. I heard her voice. 6. His dog does not like bread. 7. The plate was on the table. 8. This town is very large. 9. I was talking to her at the tram stop yesterday. 10. Is that girl your sister? 11. I shall give you my book. 12. This story will be a good one.