

# DSP Homework 16

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### Abstract

In the first section I summarized the 4 videos we watched this week, and came up with my opinions. In the second section, I made my own homework set.

## 1 Videos

### 1.1 Hydrogen Energy and Cars

This video compares the advantages and disadvantages of hydrogen energy and electric energy, and mainly analyzes the differences in economic benefits between the two kinds of energy from the perspective of efficiency. Among them, electric energy refers to the battery energy storage drive motor used by most electric vehicles; At the same time, hydrogen energy refers to the use of hydrogen stored on the vehicle to generate electricity on site to drive the motor.

First of all, hydrogen energy has won a complete victory in terms of energy density. When the energy storage equipment with the same weight is fully loaded, the energy storage density of hydrogen energy is more than 200 times that of electric energy; At the same time, the time from zero to completion of charging is also a perfect victory for hydrogen energy, which leads to a great advantage in the endurance of hydrogen powered vehicles.

However, from an economic point of view, at present, due to technical limitations in production and transportation, the price of hydrogen energy is much higher than that of electric energy in theory. In addition, considering the labor cost, when actual users use hydrogen energy, the price per kilometer will be eight times that of electric energy.

### 1.2 Quantum Computers

This video is talking about quantum computers. The most interesting thing of this topic is superposition and entanglement of the qubits. Superposition makes the qubits which contains information can express 2 different state in the same time, so the information  $n$  qubits can contain is  $2^n$ , this will increase very rapidly while the number of qubits increases.

So, like the video maker says, quantum computers are good a things that a small input and output while having a vast array of possibilities. The advantage of quantum computers is that qubits are themselves possibility, so it is very easy for qubits to simulate possibilities of those particles.

Though quantum computers are strong, the working condition is too strict so that quantum computers are now unable to be widely used.

### 1.3 My Thoughts

#### Hydrogen Energy and Cars

Under the influence of society and ecological environment, electric energy has gradually been loved by people. The reason for its popularity may be to reduce pollution, but I have always wondered whether it really helps the environment a lot? We can see from this video that hydrogen energy only uses hydrogen as the medium of energy transport, and the energy that needs to be dissipated in the process of high-quality energy to low-quality energy is always there. Back to electric vehicles, we know that thermal power plants are still using a lot of energy, so electric vehicles ultimately use energy from fossil fuels. Unless they completely use clean power generation, can electric vehicles be called environmental protection?

## Quantum Computers

There's words in the video saying 'classical computers were once one room large'. Quantum computers are now newborn, have many problems like they cannot be widely used, cannot be cheap and so on. However, think the different form electronic tube to the laptop we are now using, a huge change, video maker and I believe the future of quantum computers, not because quantum is the biggest discovery in 20th century, but the 'possibilities' in the new things.

## 2 My Homework Set

1. Think about how we can accurately find the lowest frequency in a single pitch spectrum with many overtones.
2. Try to write a code to simulate a musical instrument tuner. Assume that instruments usually have multiple overtones, and that the pitch is not always the highest in frequency spectrum.