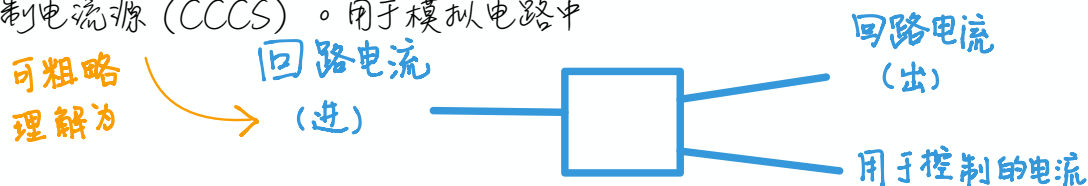


♦ Analog Circuit System Design

♦ Week 1 (2020.09.07)

- 模拟电路(analog circuit): The circuits used to handle the analog signal. **Continuous**. RLC circuit is a simple analog circuit.
- 数字电路 (digital circuit): Using digital signal to perform arithmetic operations and logical operations. **Discrete**. Just like boolean operations.
- 受控电源(controlled power source): the voltage and current of the power source is controlled by the voltage and current of other parts in the circuits. 受控电源，是指电压源的电压和电流源的电流，是受电路中其它部分的电流或电压控制的，这种电源称为受控电源。分为电压控制电压源 (VCVS)、电压控制电流源 (VCCS)、电流控制电压源 (CCVS)、和电流控制电流源 (CCCS)。用于模拟电路中



- VNC：可以用于远程控制；
- 树莓派 (raspberry pi)：基于ARM的微型电脑主板；具有所有PC的基本功能；Linux系统
- Python 中，在文件名后加“/”表示进入该文件
- Python的for循环语句：for 变量 in 列表 **:** → 记得加“:” 否则会报错

```
for 变量 in 列表:  
    过程  
else  
    过程
```

Eg1 : cla=["A","B","C","Python"]

for i in cla: → **()不能漏**

Print(i)

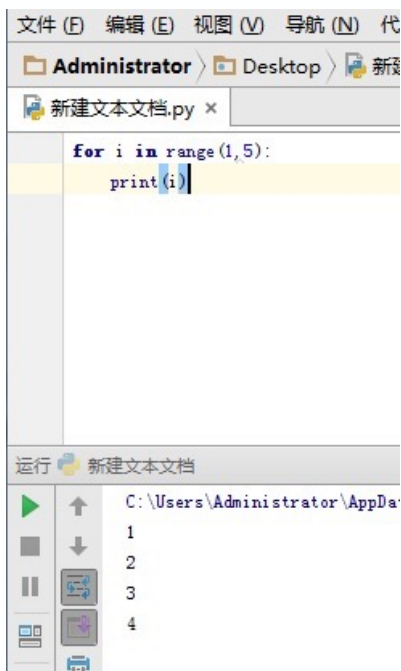
运行结果：

```
A  
B  
C  
Python
```

Eg2 : for x in range(4):

Print(x)

运行结果：0 \n 1 \n 2 \n 3

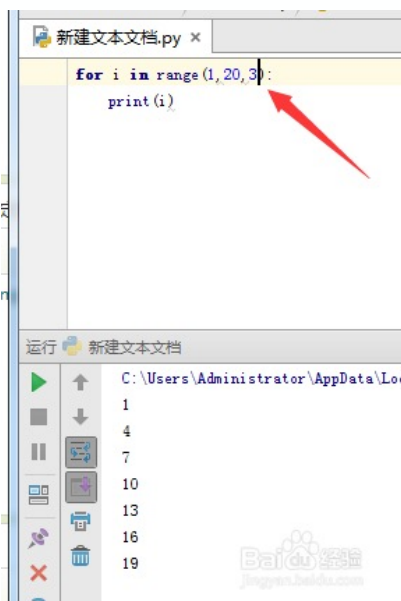


The screenshot shows a Python IDE window titled '新建文本文档.py'. The code is:

```
for i in range(1, 5):  
    print(i)
```

The output window shows the numbers 1, 2, 3, and 4, each on a new line.

Eg3: 可以设置开始和结束

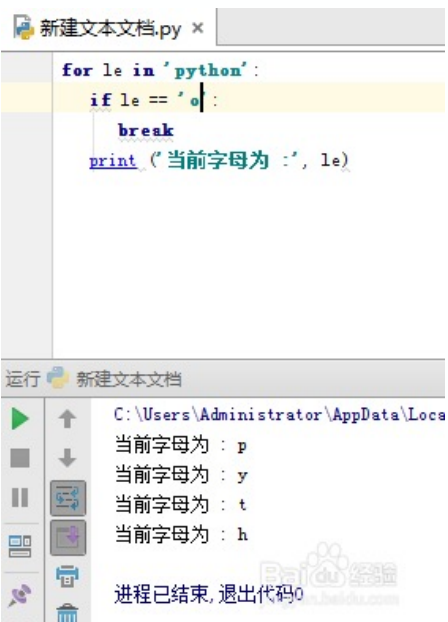


The screenshot shows a Python IDE window titled '新建文本文档.py'. The code is:

```
for i in range(1, 20, 3):  
    print(i)
```

A red arrow points to the number 3 in the range function. The output window shows the numbers 1, 4, 7, 10, 13, 16, and 19, each on a new line.

Eg4: range中可以设置开始、结束和步长



The screenshot shows a Python IDE window titled '新建文本文档.py'. The code is:

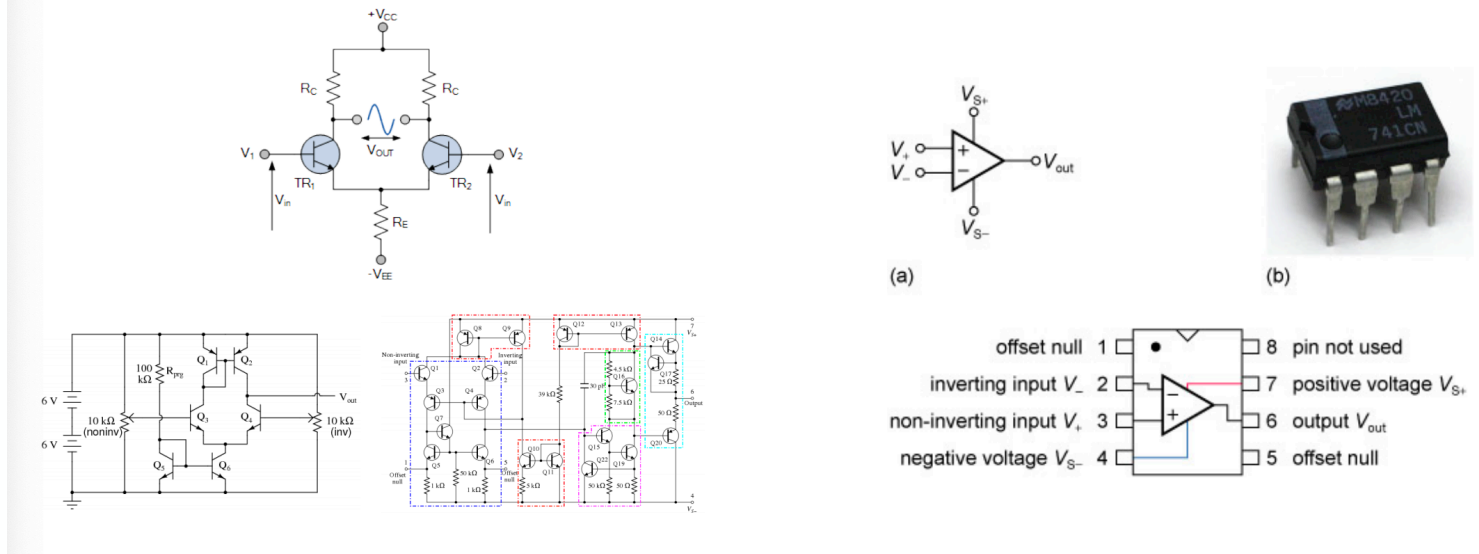
```
for le in 'python':  
    if le == 'o':  
        break  
    print('当前字母为:', le)
```

The output window shows the output for the letters 'p', 'y', 't', and 'h', each on a new line. The output for 'o' is missing. The output window also shows the message '进程已结束, 退出代码0'.

Eg5: break——满足某条件时退出循环

- Operational Amplifier (Op-Amp) 运算放大器：具有很高放大倍数的电路单元

Operational Amplifier (Op-Amp)



它是一种带有特殊耦合电路及反馈的放大器。其输出信号可以是输入信号加、减或微分、积分数学运算的结果。

- OA接入的电源可以是单电源的也可以是多电源的 (图1-2)
- 工作原理：**运算放大器有两个输入端和一个输出端，“+”同相输入端（不能叫正端），“-”反相输入端（不能叫负端）；https://www.electronicstutorials.ws/opamp/opamp_1.html

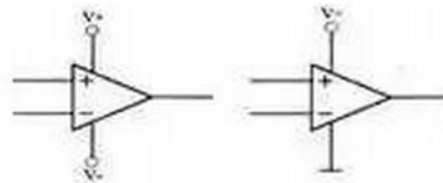


图 1-2 运算放大器可接的两种电源

Questions :

A. Raspberry Pi

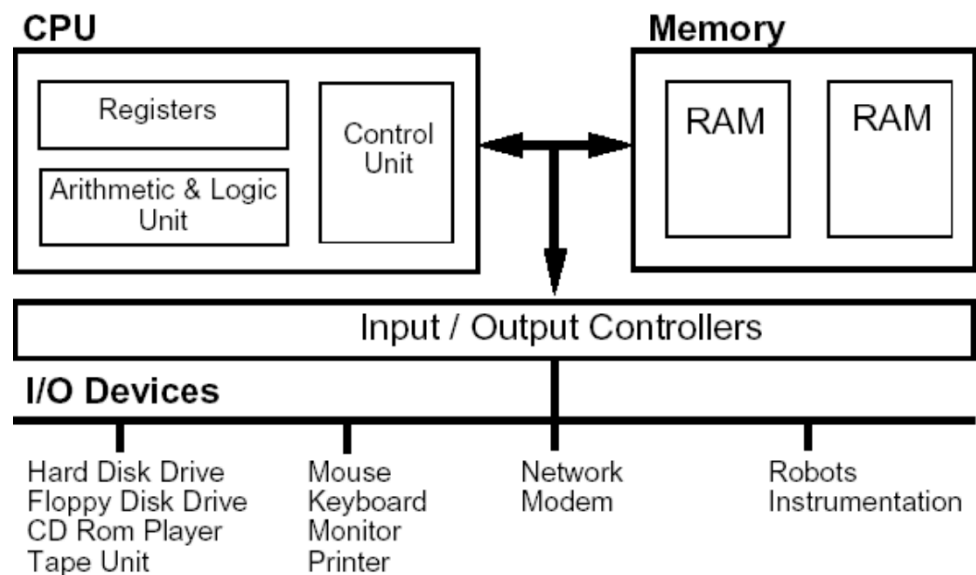
- What are the differences between a Raspberry Pi and an Arduino? (Arduino是便携开源电子原型平台)？——Arduino是一个单片机（集成电路芯片，是一个小而完善的微型计算机系统），在机器里不会运行现有的通用OS；RPi是简化了的微型电脑，可以运行完整的OS。
- What can you do with a RPi? ——Can do most of the things that normal computer can do. And it's more portable and of low energy. It can be used in some little interesting devices as their built-in computer.
- What are the components of a modern electronic system, such as RPi? A robot? ——电子计算机系统：输入设备、输出设备、控制器、运算器、存储器；

d. What is computer architecture? What are the necessary components of a computer? ——是程序员所看到的计算机的属性，即概念型结构与功能属性；冯诺伊曼结构Von neumann; input device、output device、CPU (ALU、CU)、memory

B. This course:

a. What is analog circuit? And digital circuit? ——Analog: 是指用来对模拟信号进行传输、变换、处理、放大、测量和显示等工作的电路。模拟信号是指连续变化的电信号。主要包括放大电路、信号运算和处理电路、振荡电路、调制和解调电路及电源等。eg: RLC (见开头) Digital circuit: 基本单元--逻辑门，由许多的逻辑门组成的复杂电路。以二值数字逻辑(0&1)为基础，其工作信号是离散的数字信号。电路中的电子晶体管工作处于开关状态，时而导通，时而截止。

Computer Architecture



b. What are the connections between analog and digital? ——Difference: 1、在一个周期内模拟电路的电流和电压是连续的，而数字电路中它的电流和电压是脉动变化的； 2、模拟电路和数字电路它们同样是信号变化的载体，模拟电路在电路中对信号的放大和衰减是通过元器件的放大特性（如三极管）来实现操作的，而数字电路是对信号的传输是通过开关特性（如三极管）来实现操作的； 3、在模拟电路中，电压，电流频率，周期的变化是互相制约的，而数字电路中电压电流频率周期的变化是离散的； 4、模拟电路可以在大电流高电压下工作，而数字电路只是在小电压，小电流低功耗下工作，完成或产生稳定的控制信号； 5、模拟电路是为数字电路供给电源而又完成执行的机构。而数字电路是通过它特有的逻辑运算来完成整

个电路的操作过程。

- c. What are the subjects beyond analog and digital signal in an electric system?
—— ? ? ? ? ? don't understand the meaning of this question , what subject ?
- d. What are the connections of electronic systems to other subjects such as materials, mechanical systems and prototyping? Use Robomaster Ai robot as an example?
—— electronic systems can be used to controlled the robot' mechanical system while the mechanical system is the carrier of the electronic system. To build the body(mechanical part), we need to choose proper material and prototype it.