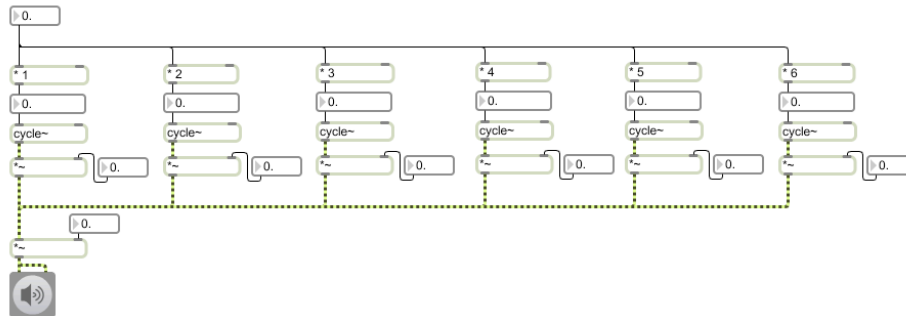
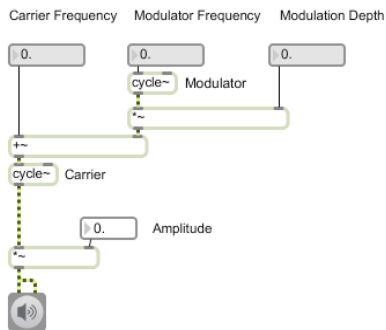


**COMPOSITION: ELECTRONIC MEDIA II**  
**March 30, 2009**  
**Synthesis in Max/MSP**

1. Discussion of Additive Synthesis

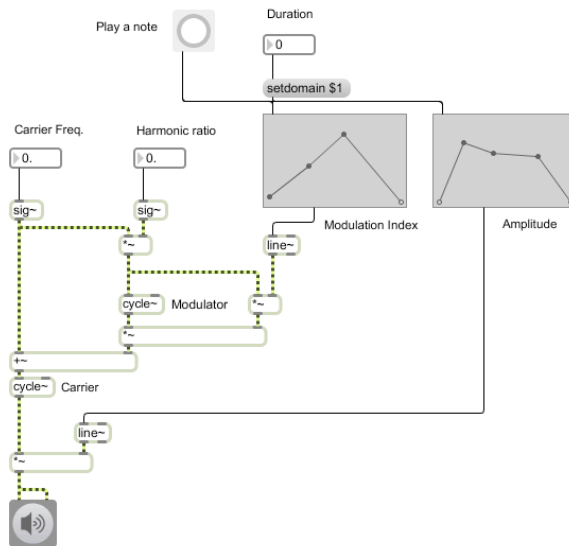


2. Basic Frequency Modulation (FM) Synthesis



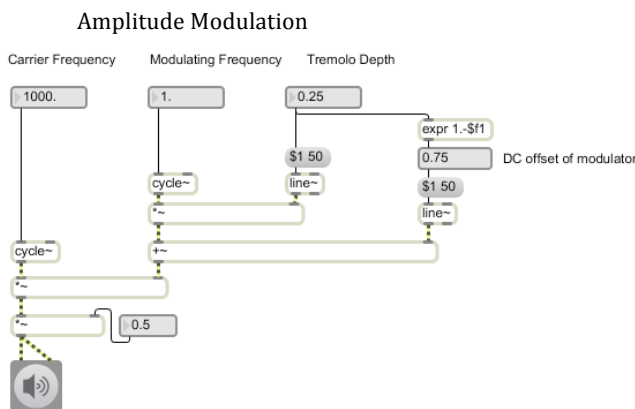
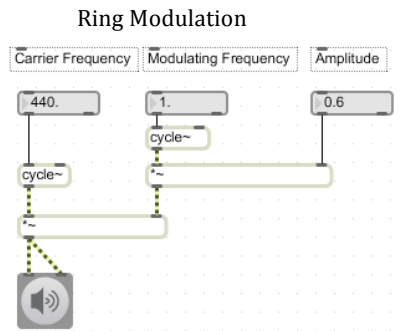
- a. Go to **File** menu and choose **New Patcher**
- b. Create a **dac~** object with a toggle switch, or an **ezdac~** object.
- c. Place a **\*~** object above **dac~** object. Connect the outlet of the **\*~** object to the inlets of the **dac~** object. Connect a **flonum** to the right inlet of the **\*~** object.
- d. Create a **cycle~** object and connect its outlet to the left inlet of the **\*~** object. This **cycle~** object will serve as the carrier.
- e. Create a **+~** object and connect its outlet to the left inlet of **cycle~** object.
- f. Create another **\*~** object and connect its outlet to the right inlet of the **+~** object.
- g. Create another **cycle~** object and connect its outlet to the left inlet of the **\*~** object in step 1f. This **cycle~** object will serve as the modulator.
- h. Connect **flonums** to the following:
  - i. **+~** object - left inlet
  - ii. Modulator **cycle~** object – left inlet
  - iii. **\*~** object of step 2f – right inlet

3. To achieve better control over the frequency, envelope and timbre of the sound add the following to the patcher in step 2.

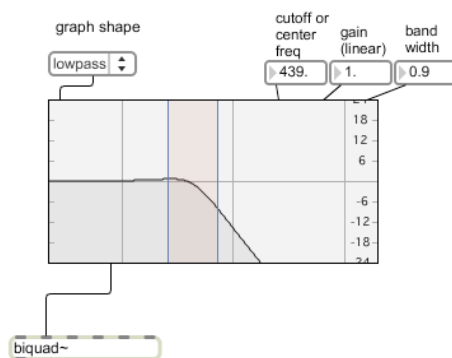


- a. Disconnect all **flonums**.
- b. Create a **sig~** object and connect its outlet to the left inlet of the **+~** object. Place the **sig~** object high enough above the **+~** object as shown in the picture. Connect a **flonum** to the inlet of this **sig~** object.
- c. Create a **\*~** object and connect its outlet to the left inlet of the modulator **cycle~** object. Connect the outlet of the **sig~** object of step 3b to the left inlet of this **\*~** object.
- d. Create another **sig~** object and connect its outlet to the right inlet of the **\*~** object of step 3c. Connect a **flonum** to the inlet of this **sig~** object.
- e. Create another **\*~** object and connect its outlet to the right inlet of the **\*~** object below the modulator **cycle~** object. Connect the outlet of the **\*~** object of step 3c to the left inlet of the **\*~** object you have just created.
- f. Create two **line~** objects. Connect one of them to the right inlet of the **\*~** object of step 3e, and the other to the right inlet of the **\*~** object above the **dac~**.
- g. Create two **function** objects and connect their outlets (second from the left) to the left inlets of the **line~** objects of step 3f.
- h. Create a **button** object and connect it to the inlets of the two **function** objects.
- i. Connect a **number** to a **message** with the argument "setdomain \$1". Connect the **message** to the inlets of the two **function** objects.

#### 4. Ring Modulation and Amplitude Modulation



#### 5. One band filter with *biquad~* object and *filtergraph~* object



- Second outlet from the left of *filtergraph~* object connects to the second inlet from the left of the *biquad~* object. Signal input is in the left inlet of the *biquad~* object.
- umenu** object in left inlet of the *filtergraph~* object controls the graph shape – low pass, high pass, band pass etc.
- flonums** in the three inlets from the right controls band width, gain and cutoff/center frequency.