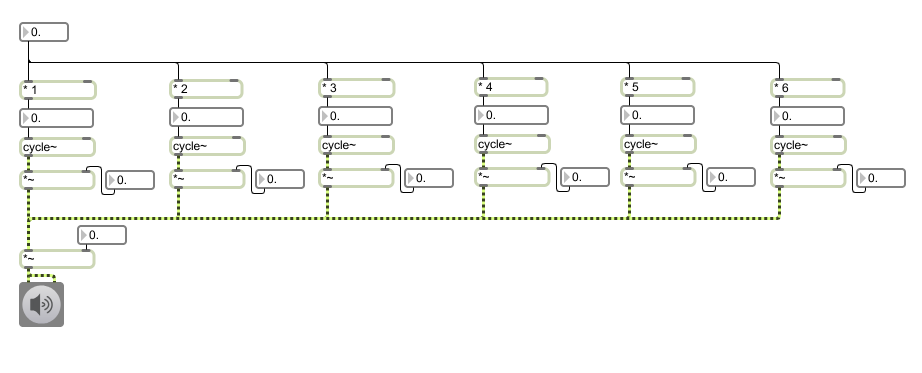
**COMPOSITION: ELECTRONIC MEDIA II**

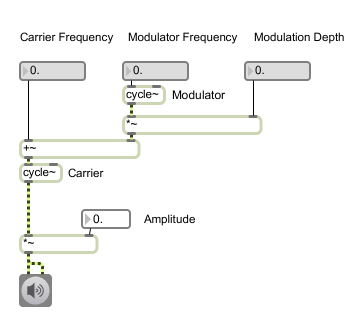
**March 30, 2009**

**Synthesis in Max/MSP**

1. Discussion of Additive Synthesis

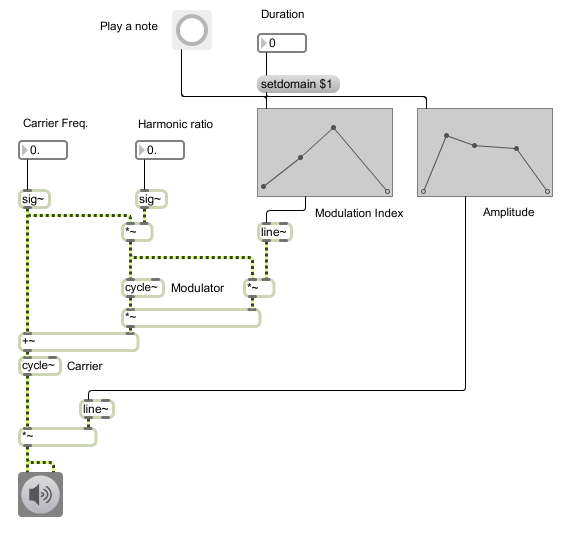


1. Basic Frequency Modulation (FM) Synthesis



* 1. Go to **File** menu and choose **New Patcher**
  2. Create a **dac~** object with a toggle switch, or an **ezdac~** object.
  3. 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.
  4. Create a **cycle~** object and connect its outlet to the left inlet of the **\*~** object. This **cycle~** object will serve as the carrier.
  5. Create a **+~** object and connect its outlet to the left inlet of **cycle~** object.
  6. Create another **\*~** object and connect its outlet to the right inlet of the **+~** object.
  7. 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.
  8. Connect **flonum**s to the following:
     1. **+~** object - left inlet
     2. Modulator **cycle~** object – left inlet
     3. **\*~** object of step 2f – right inlet

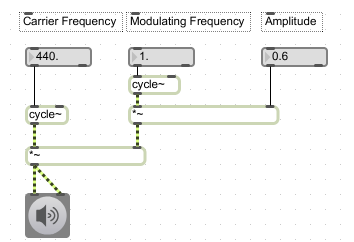
1. To achieve better control over the frequency, envelope and timbre of the sound add the following to the patcher in step 2.



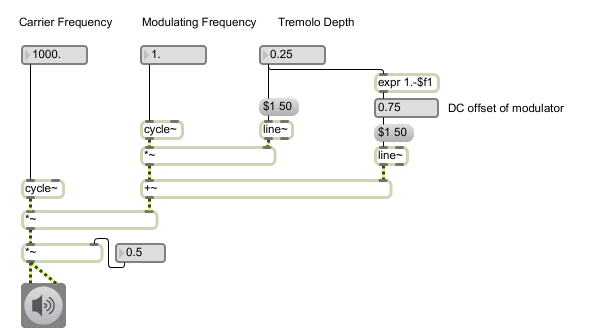
* 1. Disconnect all **flonum**s.
  2. Create a **sig~** object and connect its outlet to the left inlet of the **+~** object. Place the **sig~** object high enough above the **+~** object as shown in the picture. Connect a **flonum** to the inlet of this **sig~** object.
  3. Create a **\*~** object 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.
  4. 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.
  5. 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.
  6. 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~.**
  7. Create two **function** objects and connect their outlets (second from the left) to the left inlets of the **line~** objects of step 3f.
  8. Create a **button** object and connect it to the inlets of the two **function** objects.
  9. Connect a **number** to a **message** with the argument “setdomain $1”. Connect the **message** to the inlets of the two **function** objects.

1. Ring Modulation and Amplitude Modulation

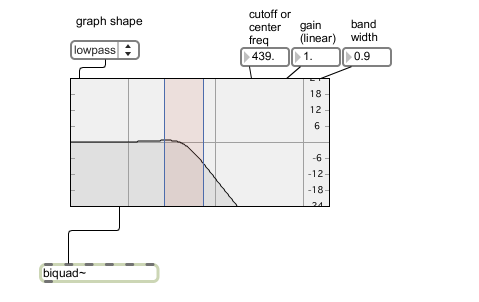
Ring Modulation



Amplitude Modulation



1. One band filter with ***biquad~*** object and ***filtergraph~*** object



* 1. 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.
  2. **umenu** object in left inlet of the ***filtergraph~*** object controls the graph shape – low pass, high pass, band pass etc.
  3. **flonum**s in the three inlets from the right controls band width, gain and cutoff/center frequency.