# Alert Simulator Design

Shuo Yang (2/20/2017)

1. From Abi's dataset, identify all objects that have light-curve associated with them. These objects must have light curves with data points covering period greater than 30 days.

2. Pick a (Ra, Dec) as the centra (Ra, Dec) for a template image, and width in both direction. Split this template image into image sections and then split image sections into image rafts (this exists only to facilitate LSST data in reality, we don't use it actually)
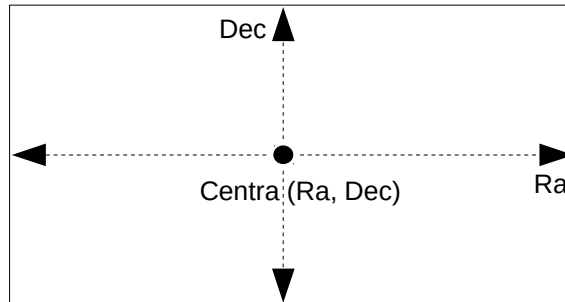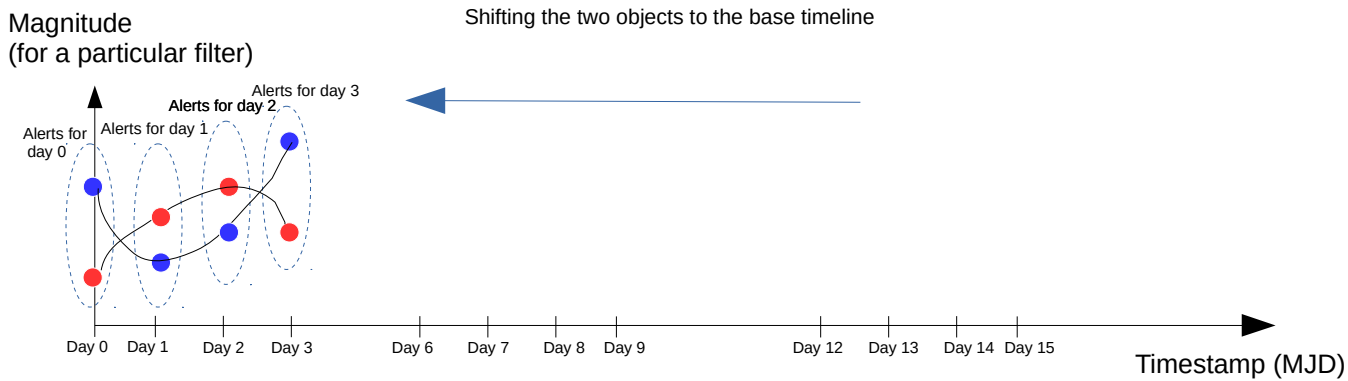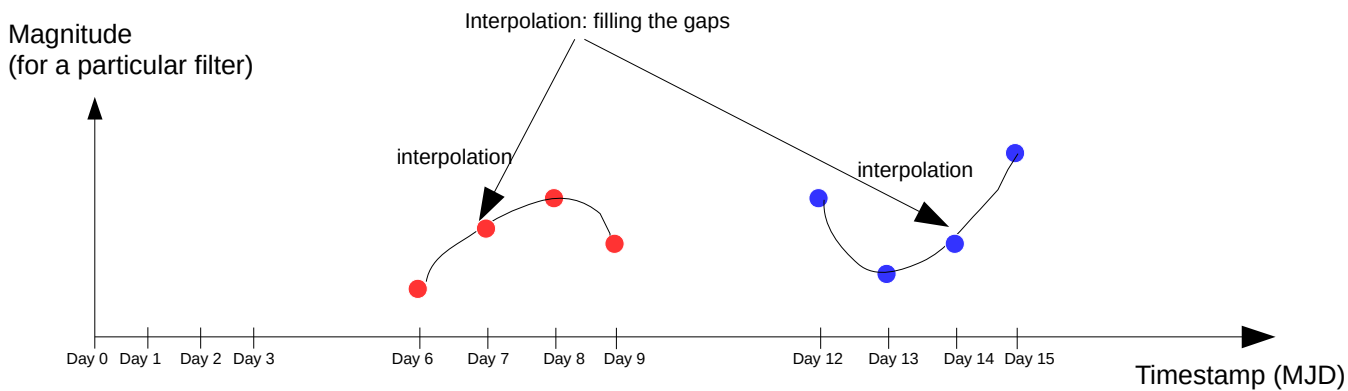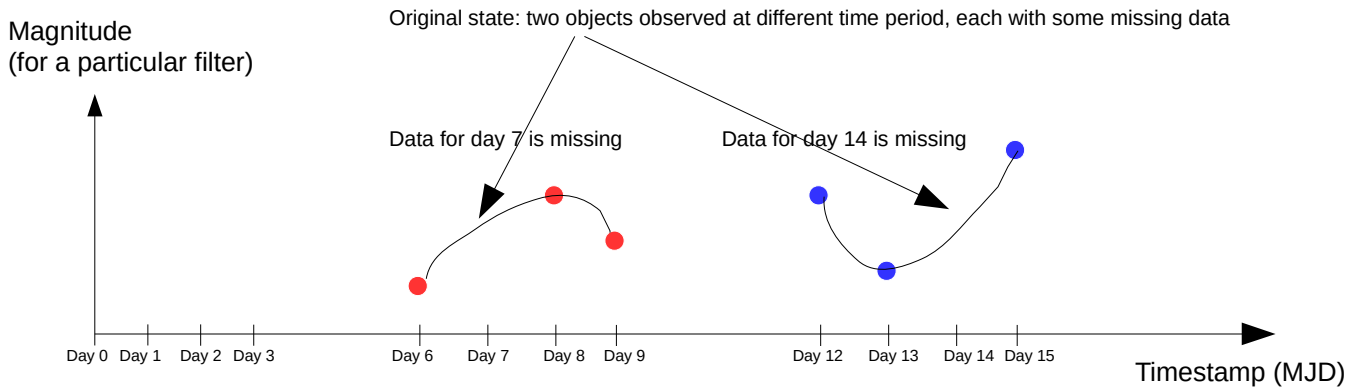

By default, choose width = height = 3.5 degrees, since LSST field of view is around 3.5x3.5 square degrees.

3. Generate (Ra, Dec) pairs within the template image.

Randomly generate (Ra, Dec) pairs within the template image if we don't care about association against catalogs. If we want associations against catalogs, first query the catalogs for astro-objects in the rectangle, and then use those RA, Dec + some random noise as the positions.

4. Associate each (Ra, Dec) pair generated at step 3 with one object in Abi's dataset.

5. Model each object's light-curve data to let us create consecutive alert stream for each day given a base timeline. This is process is the most complicated, so is illustrated in the below figure:
(for simplicity, we now only consider a single passband)

**Magnitude
(for a particular filter)**

Original state: two objects observed at different time period, each with some missing data

Data for day 7 is missing

Data for day 14 is missing

Day 0 Day 1 Day 2 Day 3   Day 6 Day 7 Day 8 Day 9   Day 12 Day 13 Day 14 Day 15

Timestamp (MJD)

**Magnitude
(for a particular filter)**

Interpolation: filling the gaps

interpolation

interpolation

Day 0 Day 1 Day 2 Day 3   Day 6 Day 7 Day 8 Day 9   Day 12 Day 13 Day 14 Day 15

Timestamp (MJD)

**Magnitude
(for a particular filter)**

Shifting the two objects to the base timeline

Alerts for day 3

Alerts for day 2

Alerts for
day 0

Alerts for day 1

Day 0 Day 1 Day 2 Day 3   Day 6 Day 7 Day 8 Day 9   Day 12 Day 13 Day 14 Day 15

Timestamp (MJD)

Each alert generated is associated with four properties: timestamp, magnitude, magnitude error, filter (passband).

6. Write the generated alerts into a single binary file defined by image-level alert packet spec.