Services for Theory in the VO

- Software: NEMO, Starlab
  - Data conversion (too many...)
  - SnapShot gridding
- TVO demo 2004 AAS "*CMD of GC*"
  - Not a service: cgi-bin + webform

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Services for Theory in the VO

- What services do we need?
  - Find or Create data
  - Extract data
  - Analyze data:
    - Plot
    - Compare w/ theory
    - Compare w/ observations
    - ...
  - Write paper

Services?

- Find data based on: (provenance)
  - Journal article
  - Author of the simulation
  - Object(s) in the simulation
    - Mathematical, based on input
    - Perceived, based on output (if available)
    - Other (nbody, nstars, nsph, size, ...)

Services? (cont'd)

- Create data
  - Based on input parameters from "Find data"
  - Some new service

Services? (cont'd)

- Extract data *(are all data really tables?)*
  - SnapShots: (PAT "cubes") $\left\{t_j, \left\{x_i, v_i, ...\right\}_{i=1..N}\right\}_{j=0,...}$
    - P: N = families of particles
    - A: attributes (x,v,M,R,T,...)
    - T: time

      $$N = N_{f1} + N_{f2} + ...$$

  NbodyFITS

  - WorldLines: (TAP ?) $\left\{t_k, x_k, v_k, ...\right\}_{k=..}$
    - Native format for collisional dynamics
    - Observer-centric time-delayed Cosmological?
  - APT cubes ("object" memory model, e.g. NEMO)
    - Most codes don't use this

Analysis example: gridding

- NEMO: `snapgrid`

- Splotch

- ...

NEMO::snapgrid

```
In=            Input file (a snapshot)
Out=           Output file (an image)
Times=         Times to consider
Xrange=        Range in X to grid (min:max)
Yrange=
Zrange=
Xvar=          X-variable to grid
Yvar=
Zvar=
Evar=          Emission variable
Tvar=          Optical depth variable
Dvar=          Depth variable
Svar=          Smoothing variable
Nx=            Number of pixels in X
Ny=
Nz=
Moment=        Moment in 'zvar' (-2, -1, 0, 1, 2, ...)
Mean=          Use mean per pixel/voxel
Stack=         Stack all snapshots into one image/cube?
Integrate=     Integrate along 'dvar'  instead of summing?
```

Services? (cont'd)

- Analyze data
  - Plot *basic* attributes
    - SnapShot vs. WorldLine
  - Grid attributes
    - Image vs. Cube
    - Compare to (observational) data
    -

An Old Demo

- AAS 2004: TVO demo *"CMD of GC"*
  - *Store pre-computed nbody+stellar evolution sim*
  - *Store observed CMD of some clusters*
  - *Allow user to select a model, time, distance & cluster*
  - *Present comparision as figure and VOTable*

TVO demo AAS203
Overview

Action:

Select [CMD demo ▾]

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1. Choose a cluster:

○ Globular Cluster M30 @ 8.0 kpc:
● Globular Cluster NGC 104 @ 4.5 kpc:
○ Globular Cluster NGC 6397 @ 2.3 kpc:
○ Old Open Cluster M 67 @ 0.83 kpc

Override default distance (kpc): [_____]

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2. Choose a model:

○ AMNH run3: N=100,000, 0% binaries, Z=0.001, small globular cluster with 40k left at 12 Gyr
● AMNH run2: N=27,000 50% binaries, Z=0.02, rich open cluster dead at ~ 6Gyr
○ GRAPE run2
○ GRAPE run3
○ Survey2: choose parameter selections from the appropriate popup menus below
○ Test: for internal use; not for public consumption

Simulation Time (Myr): [12000.0_____]   (Use a range 5000:7000 to select a timerange, or 'all' for all times)

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3. Optional parameters for some of the models:

Survey2: *King W:* [3 ▾] *IMF slope:* [-2.35 ▾] *Binary fraction:* [0.1 ▾] *N:* [256 ▾] *Realization#:* [0 ▾]

☐ Animate CMD? (can take 2-3 minutes) ☐ debug

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4. GO:

[Start the simulation/Perform action]   [Reset all values]

An Old Demo

- AAS 2004: TVO demo *"CMD of GC"*