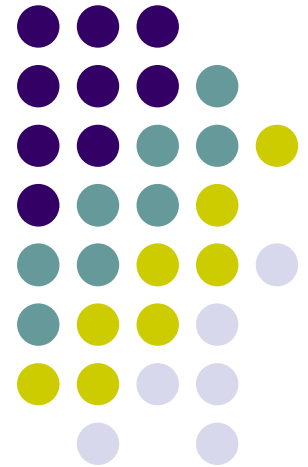
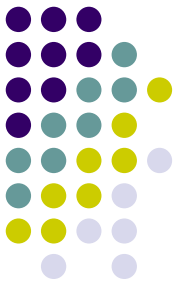


Databases for the 'Pi of the Sky' experiment

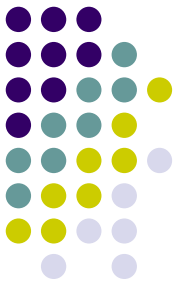
Marek Biskup
Warsaw University





Outline

- Database
- Star catalogs
- Cross-identification between catalogs
- Web interface

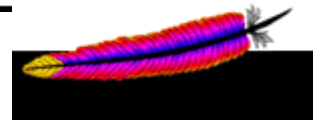


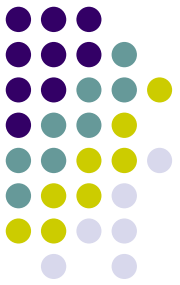
Database

- Numbers
 - Over 2 million stars from each camera
 - Around 200 measurements per star
 - Giving around 1 billion records
 - Or almost 200GB
- Requirements
 - Easy and fast access
 - Cheap software
 - Reliability
 - Scalability
- PostgreSQL + web interface (Apache + php) + local direct connection



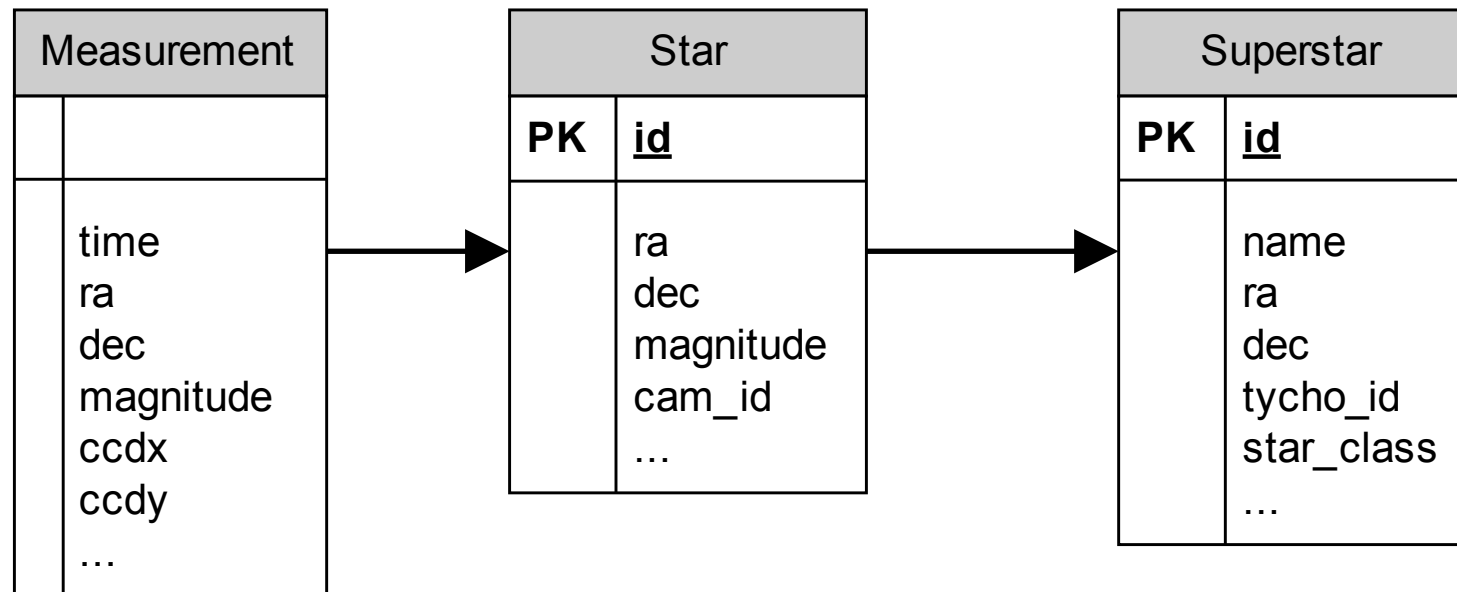
Web Server
Apache



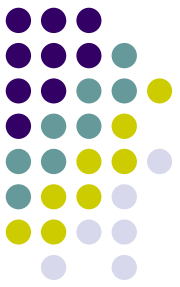


Database Schema

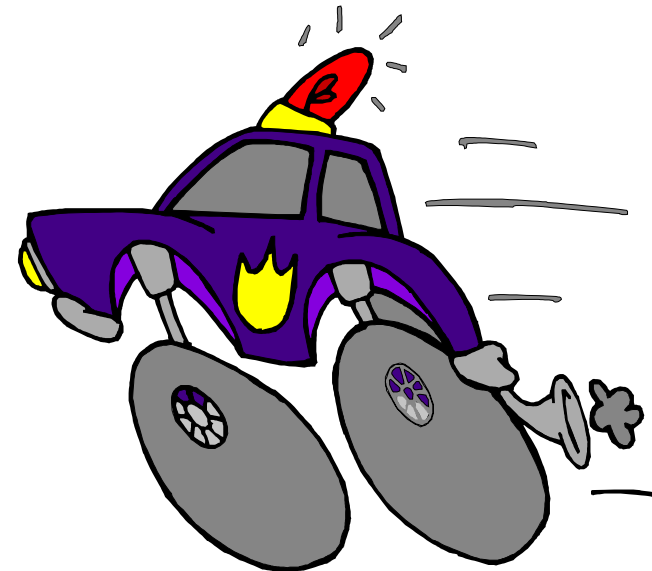
- Measurements information
- Additional information about frames, external stars, etc

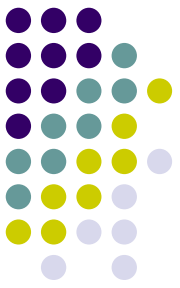


Speed optimizations



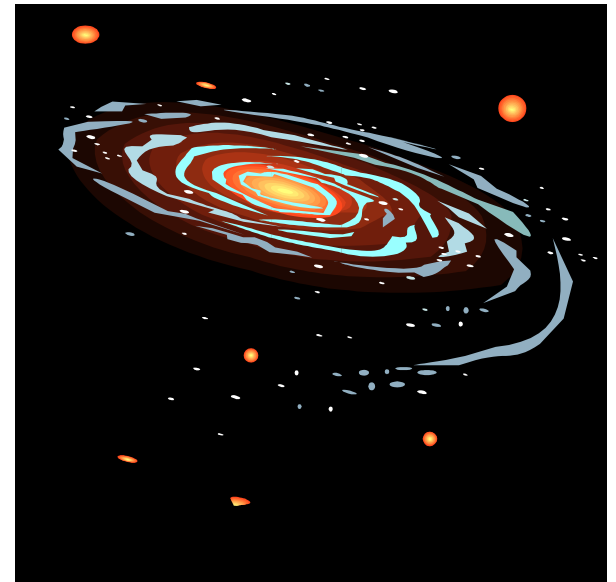
- OLAP database – tuned for fast analysis, not for fast updates
 - Indexes
 - Released constraints
 - Redundant fields (min, max and mean magnitude, number of measurements, etc.)
 - Tuned queries in applications



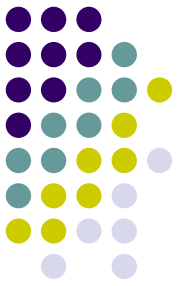


Available databases

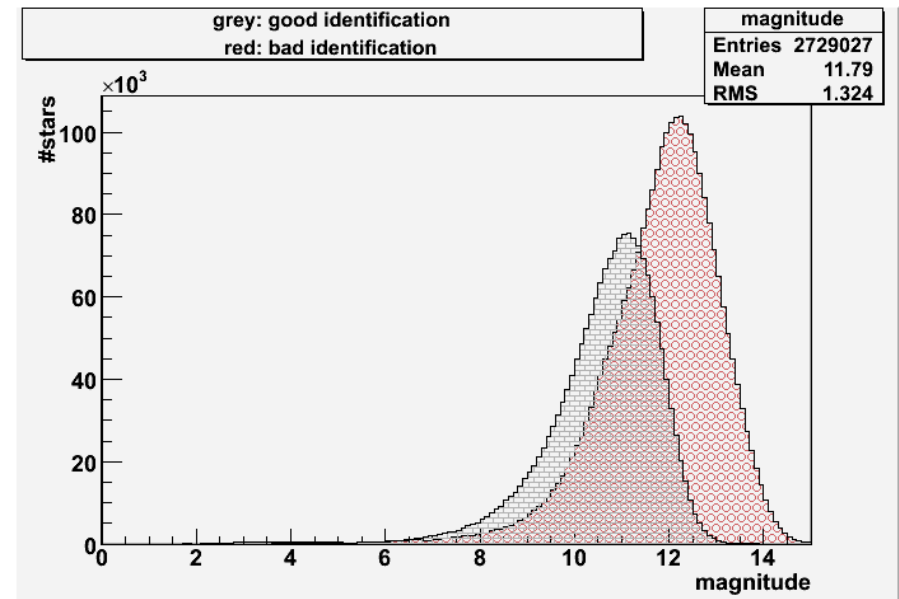
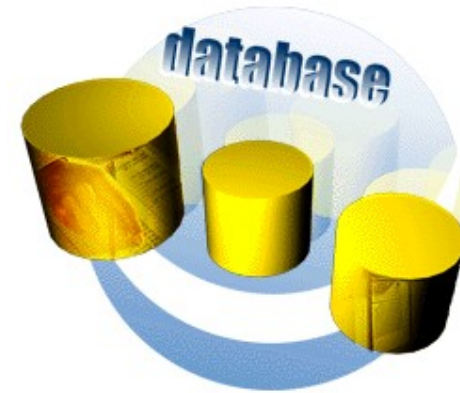
- Pi 2004-2005 (4.5 million stars, 0.8 billion measurements)
- Sky scans
- Several small databases for testing
- External databases
 - Asas
 - Gcvs
 - Tycho (2.5 million stars)
- The same schema
- The same software can be used

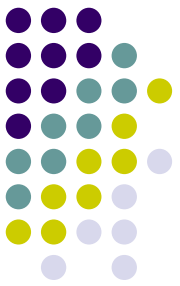


Cross-Identification



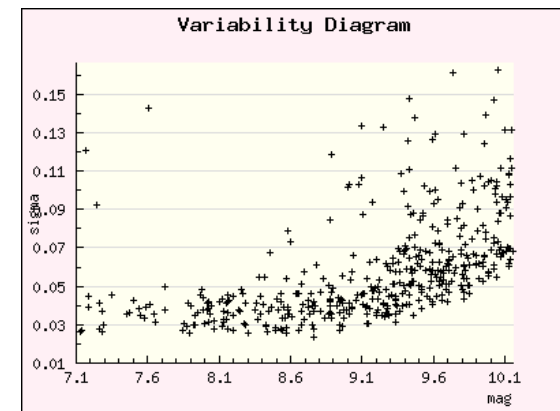
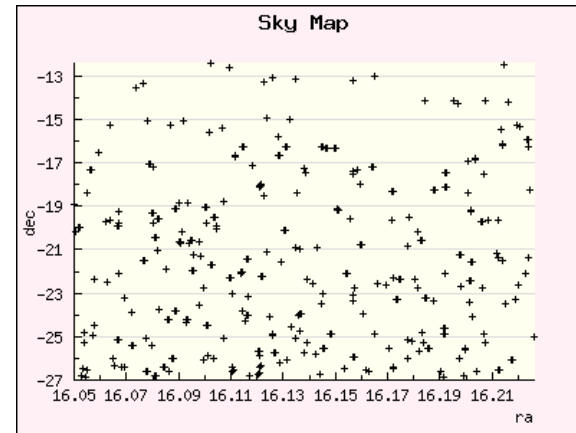
- Several databases require common reference – stars' cross-identification
 - Identification by coordinates and magnitude
 - Distance between stars small enough
 - Magnitude small enough
 - Identification for Asas, Tycho, Gcvs
 - Moderate results: for Tycho-Pi around 30% stars identified

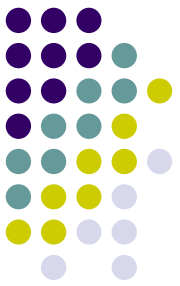




Web interface

- Php + Javascript + Apache platform
- Advanced searching
 - Coordinates, magnitude, period, #observations, variability
- Advanced browsing
 - Interactive, zoomable plots
 - Lightcurves from both cameras in the same plot
 - Merging consecutive measurements to reduce noise
- Connection with other catalogs (asas, tycho, gcv5)
 - Static link from the database
 - Dynamic searching





Web interface

Various search parameters

Searching:

<input checked="" type="checkbox"/> Ra	min	<input type="text" value="16:03:00"/>	max	<input type="text" value="16:13:34"/>	?
<input checked="" type="checkbox"/> Dec	min	<input type="text" value="-26:50:56"/>	max	<input type="text" value="-12:16:12"/>	?
<input type="checkbox"/> Search around	radius [arcsec]	<input type="text"/>			?
<input checked="" type="checkbox"/> Magnitudo	min	<input type="text" value="4.151"/>	max	<input type="text" value="10.187"/>	?
<input checked="" type="checkbox"/> Error [mag]	min	<input type="text" value="0.0045"/>	max	<input type="text" value="0.2727"/>	?
<input type="checkbox"/> Number of observations	min	<input type="text" value="80"/>	max	<input type="text" value="1000000"/>	?
<input type="checkbox"/> Amplitude [mag]	min	<input type="text" value="0"/>	max	<input type="text" value="100"/>	?
<input type="checkbox"/> Period [days]	min	<input type="text" value="0"/>	max	<input type="text" value="100"/>	?
<input type="checkbox"/> Class					

AND

<input type="checkbox"/> Ec	<input type="checkbox"/> Esd	<input type="checkbox"/> Ed
<input type="checkbox"/> DSCT	<input type="checkbox"/> RRc	<input type="checkbox"/> RRab
<input type="checkbox"/> DCEP	<input type="checkbox"/> CW	<input type="checkbox"/> mira
<input type="checkbox"/> ACV	<input type="checkbox"/> BCEP	<input type="checkbox"/> Misc

Any Other Class

/ - separates different possible (sub)classes

Help available



Web interface

Actions:

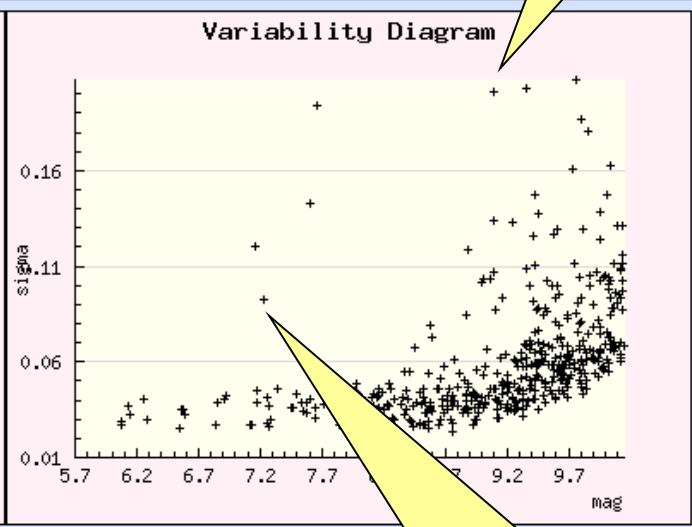
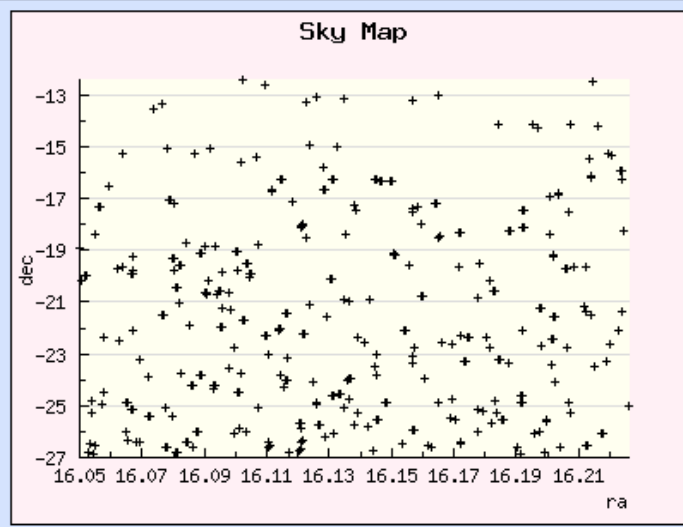
- Number of stars
- List of stars
- Plots

?

Zoomable plots
(mouse drag)

Count stars List stars Show map

<< previous page Sort by: magnitude Stars per page: 1000 next page >>



[Zoom out](#)

[Zoom out](#)

Click on a star to see
its light curve

Warsaw
2005



Web interface

160401-1945.9

● brightness
○ camera 2

HJD

[plot's data](#)
 [detailed plot's data](#)
 [ROOT macro](#)
 [Normal view](#)

Data Base Id	1814784
Id	160401-1945.9
Ra	+16.0669h 16h:04m:01s
Dec	-19.7654 ^o -19 ^o 45'55"
Magnitude [min / av. / max]	8.148 / 8.026 / 7.674
Error [mag]	0.033 ^m
Delta magnitude	0.473 ^m
Experiment	
Number of measurements	471
Amplitude [mag]	days (0 h)
t₀	HJD

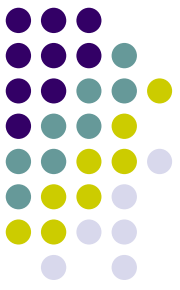
Data Base Id	<input type="text" value="1814784"/>
Period	<input type="text" value="0"/>

Bold points – camera 1
Light points – camera 2

Zoomable area

Star's details

Modifiable parameters



Summary

- Big database requires reliable and scalable platform such as PostgreSQL
- Having all databases in the same schema we have reduced time spent on writing separate software
- Having external catalogs in our databases and having links between them helps in data analysis
- Web interface provides easy and quick access to the data