Swift Follow-up with the UK's Network of Large Robotic Telescopes

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On behalf of the RoboNet-1.0, Liverpool Telescope and Faulkes Spectrograph Consortia

Overview

- Rationale
- The Telescopes
- Instrumentation
- Network Operation
- The First Hour and Subsequent Follow-up
- Conclusions and Future Developments

Robotic Telescopes

Basic problems:

- Most robotic telescopes are relatively small.
- Hard to make existing large telescopes robotic (expensive, non-robotic instruments, network security, safety, etc.)
- Single telescopes inevitably limited in response

Solution:

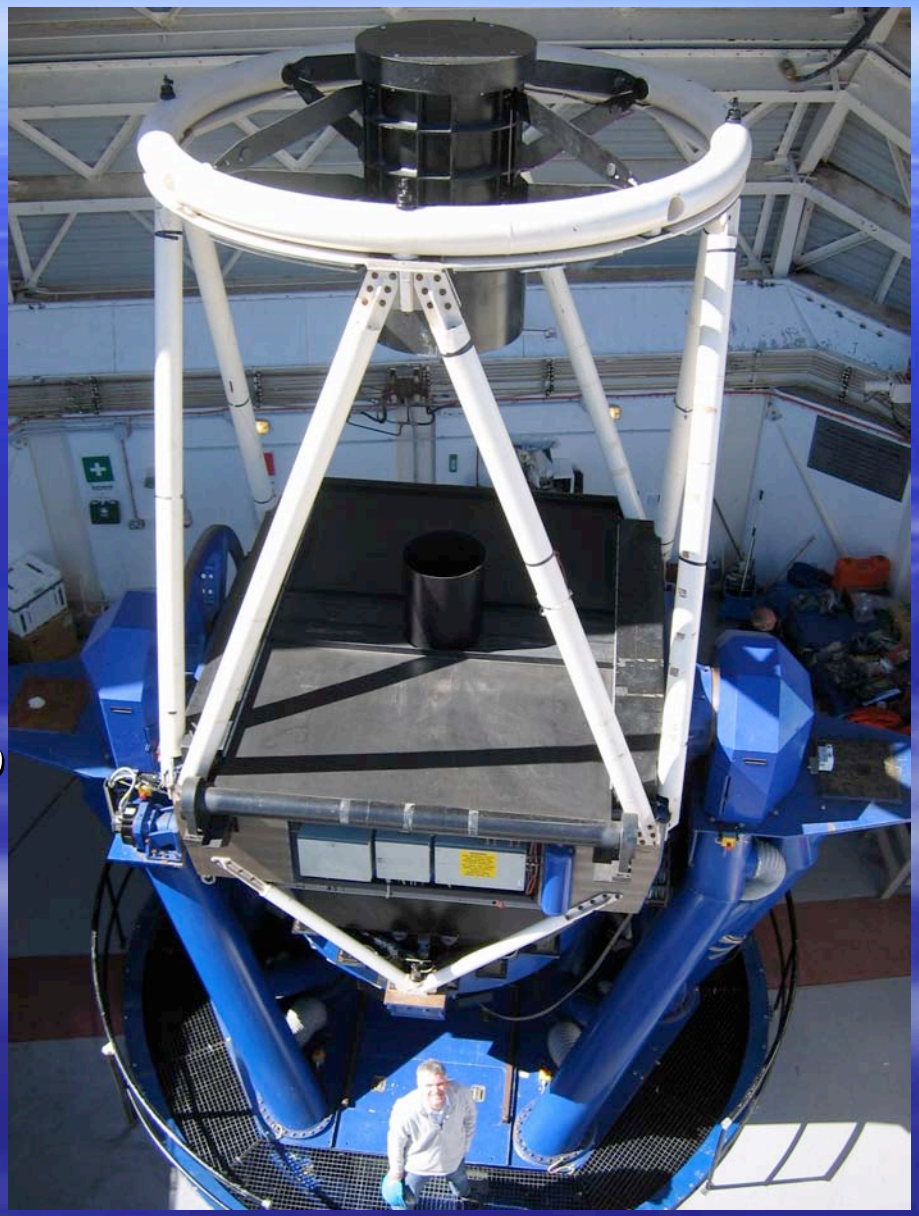
- A “large telescope” robotic network that can respond fast, requires no user intervention and has good latitude/longitude coverage.

Opportunity:

- UK has three 2-m robotic telescopes with CCD cameras and optical spectrographs (LT also has an IR camera).
- e-Science technology to optimise response already developed through “eSTAR” project.

Telescope Specifications

- Built by TTL (Liverpool)
- Alt-az, 2-m primary (f/10 Cass)
- Image quality < 0.4'' on-axis
- Pointing < 2 arcsec r.m.s.
- Autoguided tracking
- Max slew rate > 2^0 per sec
- Fully robotic
- Hard-wired interrupt response to GCN alerts in ~ 1 minute
- Fully opening enclosure

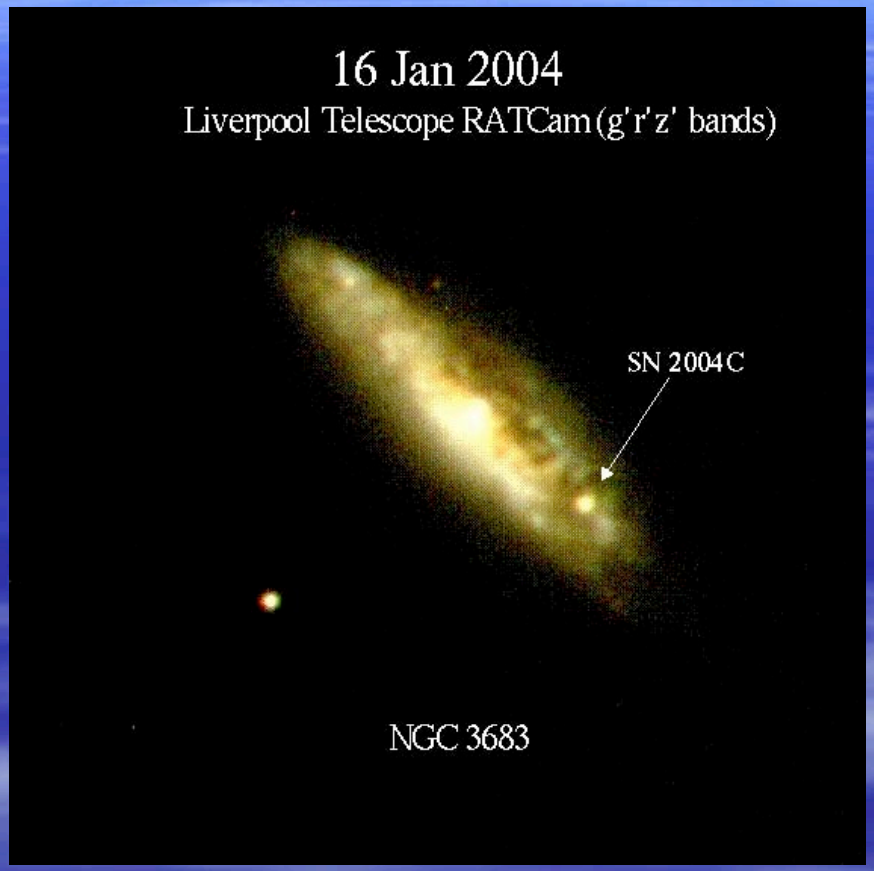


Telescope Sites

Status: LT First Light July 2003; FTN First Light Dec 2003;
FTS First Light July 2004. LT and FTN now in robotic operation

Liverpool Telescope Science

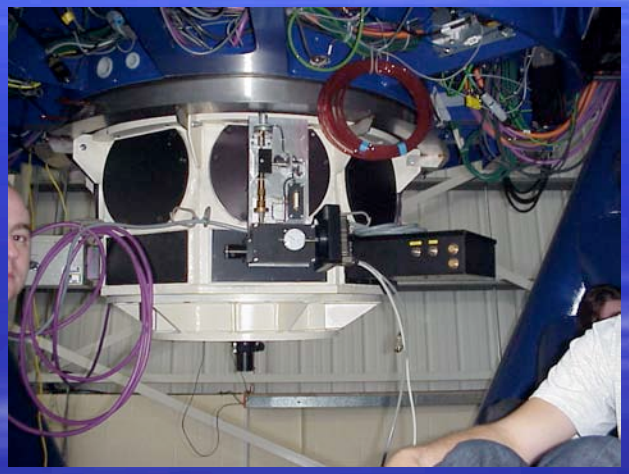
- Commenced January 2004
- E.g. Meikle et al SN programme
- Discovered by NRL 12/01/04
- In starburst galaxy NGC 3683
- Reported 15/01/04 (IAUC 8269)
- Observed with LT 16/01/04 (IAUC 8270)
- Type Ic, ~3 weeks post-max
- Colours give A_V>1 (in host)
- Monitoring continues with LT



Instrumentation

Common Instruments:

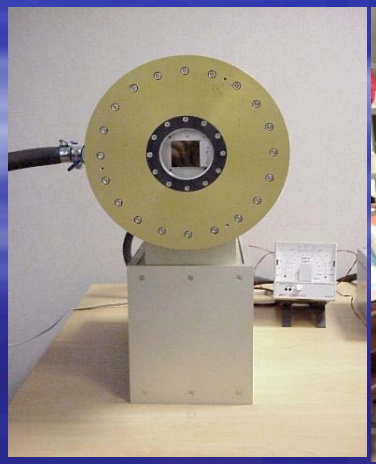
- CCD imaging camera + 8 position filter wheel (Sloan, Bessell and narrow band filters, fov=4.6 arcmin)
- Low resolution fibre-fed spectrograph (R~1000, 4400-8500A, V=15 S/N=10 t=100 sec – for FT, similar for LT low-res spectrograph)



Additional LT Instruments:

- Near IR camera (J~15 in 60 sec, fov=1.7 arcmin)
- Intermediate resolution spectrograph (R=4000 and 8000, 3750-9000A, on LT 2005)

(All instruments permanently mounted and deployable in ~30 sec)



Network Operation

- e-Science Telescopes for Astronomical Research (eSTAR)
  - 24/7 science
  - Fast reaction science
  - Distributed scheduling (global optimization – “markets”)
- Collaboration led by Liverpool JMU and Exeter University
- Prototypes developed and proved (funded by DTI and PPARC)

LT and FT Programmes + RoboNet

(All "long term" programmes)

First Hour:

- Liverpool Telescope GRB rapid-response (~ 1 min) programme (Mundell et al., Liverpool JMU) - 220 hours optical/IR follow-up awarded.
- Plus PPARC funded (O'Brien et al.) Leicester + Liverpool to build two further robotic spectrographs and add 100 hours of Faulkes Telescope time for rapid follow-up.

Subsequent Follow-up:

- Liverpool Telescope PATT programme (Tanvir – Herts - et al.).
- 2004 – RoboNet-1.0 consortium (Bode et al.) awarded a further 250 hours Faulkes Telescope time for longer time-base follow-up.

Conclusions

- Three essentially identical large robots on-stream this year (Liverpool Telescope, Faulkes Telescopes North and South)
- We are establishing a global network by adding time secured on FTs to LT capability
- GRB follow-up from Swift is a very important part of the RoboNet-1.0 programme (the other being the search for exo-planets) – forerunner of full RoboNet

(see http://www.astro.livjm.ac.uk/RoboNet)

Commercial Break

RoboNet-1.0 Project Scientist position currently open

(see September AAS Jobs Register)