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Astronomy

'Risky' fix planned for ageing Hubble

The space telescope malfunctioned unexpectedly last month, but a solution may be possible

Matthew Sparkes

NASA will attempt what has been described as a "risky" fix for the Hubble Space Telescope after several weeks of troubleshooting following an unexpected shutdown.

Spacecraft tend to use tried-and-tested technology. The Hubble telescope's payload computer is a custom-designed NASA Standard Spacecraft Computer-1 developed in 1974. This machine stopped communicating with the telescope's main computer and caused a "safe mode" shutdown on 13 June.

Since then, NASA engineers have been conducting tests and switching between main systems and their redundant backups. What was initially suspected to be a memory problem with the payload computer is now thought to be a symptom of a power supply failure or an issue with the command unit that is the heart of the telescope's control system.

Engineers are only able to issue commands via radio link as the telescope orbits about 500 kilometres above Earth. Now that the Space Shuttle has been decommissioned, there is no way to replace broken components of the telescope.

The payload computer, power supply and command unit sit within a device known as the Science Instrument Command and Data Handling (SIC&DH) unit, which controls and synchronises all the experiments on board and communicates with Earth. One of the two original SIC&DH units

The Hubble Space Telescope has been in orbit since 1990

NASA

fitted to Hubble – the "A side", as NASA calls it – failed in 2008 and was replaced during a Space Shuttle mission. Since then, Hubble has been running on the original backup unit – the "B side".

Paul Hertz at NASA says that engineers have been switching in bits of the A side replacement to work out which part of the B side has failed, but they haven't found the culprit. Now they will switch in many more components of the A side systems simultaneously in an attempt to finally divert around the broken component.

It is a "risky" move, he says, because the current A side has never been turned on in space.

"The only things we can try are things that can be commanded. You can't actually put your hands on and change hardware or take a voltage, so that does make it very challenging," says Hertz.

There are long delays between attempted fixes because engineers have to go through each plan with a fine-toothed comb to check that no upgrade or change over Hubble's decades of operation will cause problems. When they have tested the plan on an exact duplicate of the telescope on the ground, it must be approved by NASA management before it can be tried for real.

Hubble was launched in 1990 at a cost of $4.7 billion and has led to a series of discoveries that helped determine the rate of expansion of the universe.

"Eventually everything breaks. The second one of some redundant system will fail," says Hertz. "It's like which light bulb in your house is going to burn out first." ∎

Technology

YouTube promotes videos that violate its own rules

YOUTUBE'S algorithm recommends videos that violate the company's policies on inappropriate content, according to a crowdsourced study.

Not-for-profit company Mozilla asked users of its Firefox web browser to install a browser extension that tracked the YouTube videos they watched, and asked whether they regretted watching each video. Between July 2020 and May 2021, 37,380 users flagged 3362 such regrettable videos, a fraction of 1 per cent of all those they watched. Reports of these were highest in Brazil, with about 22 videos out of every 10,000 viewed being logged as regrettable.

Researchers watched the videos, checking them against YouTube's content guidelines. About 12 per cent of the reported videos either shouldn't be on YouTube, or shouldn't be recommended through its algorithm, said the researchers; about a fifth would be classified as misinformation, and a further 12 per cent spread covid-19 misinformation. Others had violent or graphic content and hate speech.

"Some of our findings, if scaled up to the size of YouTube's user base, would raise significant questions," says Brandi Geurkink at Mozilla in Germany. "What we've found is the tip of the iceberg."

Most of the contentious videos were delivered through YouTube's algorithm, which recommends videos from channels that a user may not follow or hasn't searched for. Seven in 10 of the regret reports were tied to recommended videos, which were 40 per cent more likely to be regretted than videos users actively searched for, says the team.

Non-English language videos were 60 per cent more likely to be regretted, which may be because YouTube's algorithms are trained on primarily English-language videos.

A YouTube spokesperson said the company had made changes to its recommendations system in the past year that reduced consumption of "borderline content" to less than 1 per cent of all videos. ∎

Chris Stokel-Walker

"Scaled up to YouTube's user base, this raises questions. We've found the tip of the iceberg"