Live Casting:
Bringing Astronomy to the Masses in Real Time

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Summary

The way we receive information in today's digital society has radically changed. Audiences are no longer passive consumers of content, but expect to be able to access the latest news rapidly from a variety of portals and sources. The needs of this rapidly expanding tech-savvy community are being met by a community of bloggers, podcasters and vodcasters, who use a suite of textual, audio and video content to reach their audience, many of whom subscribe to and follow content they enjoy. These communicators are the new faces of public outreach and journalism, and they are most effective when closest to the action. This desire to bring online audiences into the conference room alongside the scientists and professionals had led to the development of live-blogging. The idea is simple; anyone sitting somewhere interesting only needs a connection to the internet to report their experiences in real time.

Introduction

In the internet age, the time between when news is made and when it is consumed has shortened dramatically. In the past it might have taken several months for announcements from scientists to transform from press releases into magazine articles sitting on a newsstand. Science coverage in newspapers shortens this period to a few days. The spread of high speed internet connections has collapsed this period to just a few hours, with many stories receiving wide coverage within minutes of release.

In 2005 a new trend began to emerge for the media coverage of events that unfold over days or weeks: live blogging. Instead of waiting until after a press conference is complete, journalists are publicising events in real time, "blogging" the details to an audience through the internet.

During today's press conferences, journalists and bloggers with internet-connected laptops take live blogging to a new level, and not only type away as researchers speak, making the discoveries known immediately to a worldwide audience, but they also stream audio and video to an international audience, allowing questions from the global astronomy community to be asked in the moment. Using portable technologies, it is possible to transmit pictures, text, and even live audio and video streams out to an enthusiastic audience in real time. This technology also extends beyond the press conference, and allows scientists and journalists to convey the results presented in conference oral and poster sessions. It is even possible to conduct and stream interviews and conference sessions, thereby allowing the public to participate in a part of the scientific process that is generally kept behind closed doors.

In this paper we describe the technology and infrastructure that are required to make live webcasting a reality, strategies for creating content the public will want to consume, and describe the impact of our work.

Technology

Live webcasting is an overarching term that describes a suite of internet communications pipelines that allow bloggers, podcasters and videocasters to convey content to the public in real and near-real time. This suite includes: text-based (live blogged) content including Twittering, audio content, and video content. In the following subsections we discuss each of these technologies in turn. In addition to what is listed below, we also recommend carrying a digital camera.

Live blogging

The idea of live blogging is simple: an individual with a computer or other internet-enabled device sits at a live presentation and makes frequent updates to a website, allowing people to know what is happening in real or near-real time. Since 2005, the number of science bloggers has slowly increased, as has the diversity of ways

Figure 1. Gay recording an audio interview with Ralph Harvey (left) at LPSC. Credit: Astronomy Cast.

meetings are conveyed. Today, live blogging comes in two basic flavours, full blog and micro blog (e.g., Twitter) coverage.

At their most basic level, blogs are RSS feeds that contain at least text. RSS, which stands for Really Simple Syndication, is a type of feed that uses the eXtensible Markup Language (XML) to transmit content in a set format understandable by web pages and aggregation software (see Gay et al., 2006, for examples and a complete description). These RSS feeds typically appear on a website that updates when the RSS is updated with a new story. Any RSS feed can also be subscribed to via aggregation software. Creating such a blog has been made easier by the advent of easily available software and hosting; the most

prevalent blog software packages today are MovableType/TypePad (Trott, 2008) and Wordpress (Boren et al., 2008), while hosting companies such as Wordpress.com and Blogger.com are frequently used by the public and scientists alike.

There are just three elements needed to live blog using an existing standard blog: a person capable of listening and writing simultaneously, an internet-enabled device capable of communicating to the blog website and an internet connection. We recommend using a laptop computer with both a wireless card and a cellular internet card available. The procedure is simple: an individual sits in a session and translates to a public audience what is being said while an event is taking place, pushing their content to their blog in frequent bursts, often at the end of every five-minute talk or after writing each paragraph during longer sessions.

One of the greatest hurdles to overcome in live blogging is simply getting online.

Many event facilities do not provide internet access in all the rooms. Many conference buildings also do not have a good cell phone signal throughout the facility. We strongly recommend working with conference organisers when possible to facilitate online access. Should internet access not be available in sessions, it may be necessary to blog in a text window, and then find a point where cellular internet access is available to upload stories between events.

The second largest hurdle to overcome is simple mental overload. Science sessions often last more than an hour and can include eight or more talks in that short period of time. Trying to constantly translate presented science content to a public audience is an exhausting process.

To cover meetings effectively, we recommend having two bloggers per day's worth of sessions you wish to cover. This means that if you want to fully blog a meeting with four parallel sessions running at all times, eight bloggers are needed. In general, it is rare at smaller meetings for there to be more than one newsworthy event at a given moment, and two bloggers are sufficient.

The second text-based mechanism for live blogging a meeting is to use Twitter (2008) or a similar micro-blogging technology. Twitter is a free web-based micro-blog service that allows users to "tweet" 140 characters at a time to anyone who subscribes to their RSS-based Twitter feed. Several NASA missions, including both Phoenix[1] and the Lunar Reconnaissance Orbiter[2], use this service to communicate updates on their programmes. NASA Education and Public Outreach specialist Stephanie Stockman frequently Twitters the content of science conferences under the username Geosteph. Twitter does not require an internet connection: it is possible to tweet via SMS text messaging from any standard cell phone. While being confined to 140 characters makes it difficult to translate complex science terms to the public, it is possible to share announcements that include web links easily from anywhere.

Audio- or podcasting

In addition to text-based coverage, audio interviews are also a part of the live webcasting suite. While most often carried out as a series of interviews that are then pushed to the public a few hours (or a day) after recording, it is also possible to stream content via software such as Ustream.tv (discussed in detail in the section Videocasting). In this section we focus on ways to facilitate audio recording for asynchronous transmission.

For live webcasting, the most important characteristics in an audio recorder are recording quality, long battery life and small size. Both Astronomy Cast and the BBC's *The Naked Scientists* use a Roland Edirol R-09 WAVE/mp3 handheld audio recorder and (as needed) an external wired microphone. This device easily fits into most pockets, uses standard AA batteries (which conveniently also fit into pockets), and can hold several hours of audio on a standard SD memory card.

Once audio has been recorded, it typically needs to be processed for online posting, and it may require editing. The most common issues with raw audio are uneven audio levels and background noise. Producers typically employ a combination of

GigaVox's Levelator (Sharpe et al., 2008) to level audio, and one of the following to filter and edit audio: Audacity (2008), Creative Suites 3 (Adobe, 2008) or iLife (Apple, 2008).

The necessity of processing content can be one of the greatest hurdles to overcome in both audio- and videocasting. This process takes time and often requires full concentration. We have identified three different strategies for dealing with production issues for both. The most straightforward solution is to bring along a production engineer, such as a mass communications student, to the conference or event and set them up to do nothing but production. A second solution is to upload all content to an offsite production team. This solution is more time-consuming because it requires all raw content — which typically means large files of hundreds of megabytes in size — to be transmitted over the internet before production can even begin. The third solution is the least effective, but cheapest, and it is to simply use all breaks, lunch and evening time for production. This solution is too exhausting for long conferences. A fourth compromise solution is also possible: to have a two-person live blogging team take turns as production assistant and content creator, so that one person is blogging/recording/interviewing while the other person is doing audio and video editing and production.

Figure 2. Miller attends STS-124 launch. Credit: Astronomy Cast.

We strongly recommend taking a student production assistant with their own dedicated production laptop to live webcast events and concentrating the student's efforts on content editing and acquisition of "B reel" footage and photographs to use in the background. From experience, we find that for the most minimal production (adding intro and outro audio, evening audio levels, processing to correct bit rates, and posting content), each 30 minutes of audio requires at least one hour of production.

Videocasting

With the price of video cameras dropping daily, even while increasing in capability, it has become possible to obtain video easily

to either live stream or post to the internet in a variety of formats. The most commonly used options in the United States are posting content via YouTube/GoogleVideo, or streaming it live via the website Ustream.tv. Both YouTube/Google Video and Ustream.tv allow content to be embedded in any website. This means that content posted for free via these sites can be seen on any blog once it has been posted and the correct links are embedded on the target webpage.

Non-streamed, or static content, such as YouTube/Google Videos are typically recorded in 640 x 480 resolution or higher with MPEG4 encoding. Audio is typically 64 kpbs mono or 128 kbps stereo. While this can be recorded using many handheld digital cameras designed for filming stills, we recommend obtaining a digital video camera with firewire capabilities and a tripod. This type of a camera is more versatile and typically has much better audio quality. Common video production software includes iLife and Adobe Creative Suite 3. Additionally, a high-end laptop with at least 4GB of memory is recommended. We find that minimal production and uploading of five minutes of video takes a minimum of 20 minutes.

In addition to posting static content, it is also possible (and sometimes easier) to stream live content using the same Firewire camera. The popular website Ustream.tv facilitates streaming of video content. This site utilises the Adobe Flash Media server and Media Player to create on-demand video channels and corresponding chat rooms. Ustream.tv takes input from USB webcams and Firewire video cameras and audio from either those sources or another source (such as built in microphones or a Bluetooth headset). A high-end laptop is not necessary, and from experience we know that a 1.7 GHz G4 PowerMac with 512 Mb of memory is sufficient.

Streamed content is sent over the internet to Ustream.tv, and is then distributed to viewers. These viewers can interact with one another and potentially with the presenter via a live text-based chat room that can be moderated. To use Ustream.tv, it is necessary to have strong wireless signal or a physical connection to the Ethernet. Do not try and stream video content without collaborating with conference organisers as the bandwidth demands may be detrimental to other users.

One way people are solving potential camera-driver issues with Ustream.tv is to use the add-on software package CamTwist (Allocinit, 2008). CamTwist serves two purposes: it often provides

(but not always) a more stable connection between a video camera and Ustream.tv, and it also allows one to switch between cameras, use special effects, and stream images and the content provider's computer's desktop. This means that one can, in principle, switch between projecting a speaker at the podium, and a still image from the streamer's hard drive. CamTwist is Mac-only; Webcammax is a similar piece of software for the PC that is compatible with Ustream.tv.

Implementation

In this section we detail the practical implementation of live webcasting both from standard science conferences and from space exploration related events, such as mission launches and mission events (e.g., a mission's arrival at another planet).

In all instances, prior to attending the conference or event, first work with the press liaison to make sure the necessary internet access and power access will be available. It is also wise to make sure there is an interview room available as part of the press suite. Once plans are made, post announcements on the project website and all affiliated websites.

When packing to attend a live webcasting event, we recommend bringing all the following equipment in quantities appropriate to the team size:

- laptop computer (we used MacBook Pros with 4GB RAM);
- digital still camera with flash;
- audio recorder (we used an EDIROL R-09);
- video camera (we used a Canon ZR100 with extended 5-hour battery);
- extension cables;
- tripod;
- jump drive, for getting images and presentation files from presenters;
- optional: extra laptop battery.

We actually found it was best to have a spare computer. This can be dedicated to streaming video while other computers are used to blog or perform other live webcasting activities.

Once technological infrastructure needs have been met, it is time to identify a live webcasting team, taking advantage of known bloggers where possible. The ideal team consists of one or more lead live webcasters, a network of affiliated bloggers who will already be attending the meeting

and who will cross-post their content to the live webcast feed, a dedicated journalist who will transform press releases into stories (this can be a remote person), and a dedicated producer (this can be a remote person, but that is not recommended). Each team member covers a set of specific needs.

In selecting content to be covered, there are three general categories that should be covered to keep an interested audience: the science releases most likely to change our view of science; stories that have human interest; and niche stories that match the interests and passions of the content provider, presented with a personal spin that evokes a response from the audience.

Figure 3. Standard kit includes (counter clockwise from left) digital camera, video camera, wireless card, audio recorder, computer. Credit: Astronomy Cast.

Summary

In today's press-room, live webcasting is replacing traditional journalism as the first step in communicating astronomical results to the public. Through new media, large global audiences numbering in the tens or even hundreds of thousands can be easily reached. A single live webcaster at a science meeting in St. Louis can as easily reach a user in Africa as one in Chicago; the internet may have barriers, but it has no boundaries.

Live webcasting allows, as no other technique can, our audience to feel more as if they are participating in discovery; streamed video of press conferences brings several hundred extra people into the room, allowing them to share the moment news was broken.

This ability does not come without a cost and we have described above the investment in technology and people that is required. With solid planning, and support from conference organisers together with realistic expectations of what can be achieved by each team member, the technique is effective.

Acknowledgements

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Notes

[1] http://twitter.com/MarsPhoenix

[2] http://twitter.com/LRO_NASA

Biography

Pamela L. Gay is an assistant research professor at Southern Illinois University Edwardsville. Her research interests include variable stars and assessing the impact of new media astronomy content on informal audiences. When not in the classroom or doing research, she co-hosts Astronomy Cast and writes the blog StarStryder.com.

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Phil Plait, the creator of Bad Astronomy, is an astronomer, lecturer, and author. After ten years working on the Hubble Space Telescope and six more working on astronomy education, he struck out on his own as a writer. He has written two books, dozens of magazine articles, and 12 bazillion blog articles. He is a sceptic and fights misuses of science as well as praising the wonder of real science.

Emily Lakdawalla is the Science and Technology Coordinator for The Planetary Society. She received a Bachelor's degree in geology from Amherst College and then taught science to fifth- and sixth-grade children in Chicago. She went on to Brown University to study planetary geology. Lakdawalla came to The Planetary Society in 2001, and she now writes for the website and weblog, records the "Q and A" segment on the weekly Planetary Radio show and occasionally contributes to the Society's bimonthly magazine, The Planetary Report.

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