NAAPO (North American AstroPhysical Observatory)

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INTERNATIONAL METEOR ORGANIZATION

Preliminary Report on Perseid observations on August 12

From: starex@tron.gun.de (Andre Knoefel) Organization: TRON Public Mailbox, Neuss, Germany. Date: Sat, 21 Aug 1993 08:51:00 +0200

On the basis of all reports available to now we can say that the period of high Perseid activity in 1993 was August 12 from about 0:30 to 5:30 UT (with average ZHRs of order of 200 or more) with a peak between roughly 3:00 and 3:30 UT with a ZHR of order of 500. After roughly 5:30 UT, activity clearly decreased, but slowly, with some high activity persisting for several hours afterwards. When the Japanese started their observations on August 12, ZHRs were still in the range 150-200 and more or less stayed that way until daybreak. Some observers in Hungary, France and Belgium still noticed high activity when they started their observations around 19 to 20 UT, but it is important to note that the "traditional" maximum had occurred about 15 UT. Between 20 UT and 22 UT, however, activity certainly decreased more dramatically and by 22 UT on August 12 activity was back to normal levels (i.e., to what can be expected from the shower about 6 hours after the "traditional" maximum). (Mare Gyssens & Peter Brown)

8/21/93 MEETING NOTES

The meeting began at roughly 10:06am. Those in attendance were Bolinger, Barnhart, Campanella, James, Phillips, John St.Peter (from Detroit), J & K Ayotte, Mrs. McKay, Childers, Brown, and Barbara Spellerburg, who visited us last meeting during the tour.

Barnhart noted that one of the meeting room windows was unlocked, and may have been since the last meeting. He reports that **NAAPO** has roughly $4800.00 in the coffers, with some of that earmarked for Dixon's trip to Austria.

St.Peter brings modems, printers, etc to donate to the effort. **Thanks John!**

Brown reports that the scope suffers from a lot of RFI from side refraction, discovered during the recent feed-horn measurement program carried out by the summer interns. He also reports that we need to borrow a "cherry picker" (bucket truck) to conduct more tests further up the parabola. If anyone out there has one we could borrow, please contact us! He has also been writing software to pull Doppler information from Russ Childer's hydrogen cloud observations. Childers brings new

illustrations of his observations of the hydrogen cloud. He has also performed some noise temperature calculations on the receivers. He plans to move the flat to +60 degrees soon.

Phillips brings the equation solving program he promised last meeting, and introduced the group to the "billboards in space" concept, asking for their help in contacting congress in order to push a bill into law that will make illegal illuminated orbiting spacecraft for the purpose of sporting commercial messages.

Campanella reports that he continues to work on the electronic strip chart recorder project.

James reports that he has painted the crane a rust resistant grey.

HELP!

We need your help in the production of ***Signals***. Your intrepid editor is trying to increase the size of the newsletter, which of course increases the costs of reproduction. If you'd like to make a monetary donation to help keep us going, we'd sure appreciate it!

Karhunen-Loeve Transform — continuing work
by: Chuck Klein

In a previous article Phil Schumacher described the basic KLT algorithm. In this article, I will describe a slightly different aspect of the KLT algorithm that has had more attention in the literature.

In order to do new work in an area, it is important to read what has already been done. I am working with a graduate student, Fai Yeung, and one of the things he has done to search the literature for KLT work. Surprisingly, most the work with the KLT has been done for the problem of data compression and not signal detection. In order to compare our computer code with existing work, it has been necessary to try to calculate these compression schemes. It is then possible to compare the results of the detection problem as being a variation on the data compression problem.

The data compression problem is as follows: Suppose you have a set of n signals that has to be transmitted. Suppose, however, that you don't want to send the whole set of n signals because it would take too long. Instead, if there is a pattern to the

signals, you could send a short description of the pattern. However, the pattern isn't explicitly known and it must be deduced computationally based on a number of samples of the signal.

To apply the KLT for data compression one must have a covariance matrix. From this matrix, the eigenvectors are extracted. The eigenvectors now become a basis set on the receiving side and only the coefficients of a new signal in terms of these eigenvectors must be sent.

Some papers have worked on the problem of recognizing faces in terms of the KLT. In this form, the eigenvectors are elementary faces. In this paper, then new faces are expanded into a small number of "eigenfaces". Basically, a face is recognized if the short list of eigenface coefficients matches a previously learned profile.

How does the covariance matrix differ from the autocorrelation matrix that has been previously discussed? The covariance matrix does not assume that the signal is stationary, that is, is time-invariant. If you have n signals, then the covariance matrix is just the mean of the outer product of the n signal vectors. In the limit of the sample being only 1, then the data compression is perfect since the eigenvector of this matrix would only be the 1 sample itself! (Of course, it would be worthless also since there would be no savings over sending the signal itself.)

Fai Yeung has done some numerical experiments with a set of synthetic signals. As can be expected, the narrower the range of the sample signals around the actual signal, the fewer coefficients it takes to describe the signal, i.e, it compresses better. An examination of the eigenvectors verifies that unlike the fourier eigenvectors, here the eigenvectors have adapted to the data to make a more efficient representation.

How to apply data compression results to the detection problem? First, if the stationary assumption is included, the covariance matrix becomes the autocorrelation matrix results, but it takes more coefficients to represent the signal. The data compression results become a upper bound to the performance of the KLT used for data detection.

Just how good is the KLT? Experiments and theory show that it depends on the signal. Theory says the KLT is no better than the FFT for a sinusoid; our

experiments show a noticeable improvement for artificial, wide-bandwidth pulses. At this moment Fai Yeung should be trying out the KLT on simulated modem signals, signals which are designed to carry real information. We are starting on v.22 bis, an international standard. If only it were an inter-galatic one too!

***ed. note**: P. Schumacher & C. Klein are carrying out independent research on the KLT, and will report here occasionally to keep the **Signals** readers updated.*

NEW NASA CONTRACT BRINGS NEW LIFE TO BIG EAR

As the project to combine the Canadian and **Big Ear SETI** program fades into fiscal oblivion — meaning the funds have now expired — the *Research Foundation at Ohio State University* has received word that a new proposal, submitted earlier this year, has been funded. The first year is funded at about the same level the US/ Canada project was funded early 1992.

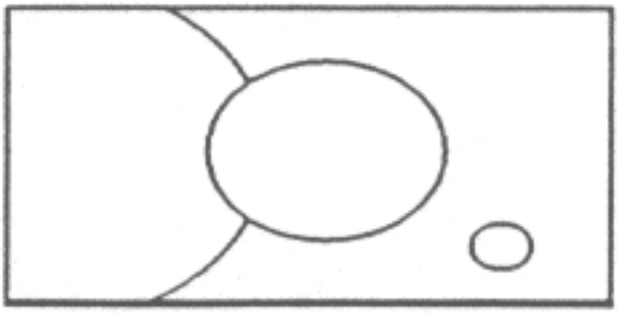
Included in the tasks to be carried out under this contract is the acquisition of a **SERENDIP IV** *4-megachannel* **SETI** *receiver*. This will be delivered as an operating (turnkey) system for which we will have to provide a powerful workstation environment to be able to operate. Completion of the receiver and payment will extend into the second year of the contract so we have a short while in which to pick up the workstation.

Dr. Klein and Steve Brown are also working over the aging flat moving controls in preparation for automating the flat motion controls so that declination of observation can be changed under computer control. This is still a feasibility and design study, but replacement switches are being studied at the present time.

The budget is tight so it will remain necessary to keep **NAAPO** solvent to pick up miscellaneous expenses not covered in the project budget. One such unbudgeted expense will be to provide Dr. Dixon transportation to Palo Alto in January to attend an important (informal) meeting.

We continue to guide and use all your contributions in a very efficient and productive way. We are not aware of many places where you can send your financial support and get more than 100% return in the form of direct support of research and development. What better place than the SETI program at **Big Ear**?

It's anthem is the wind in her trees and the waves of her seas.



It's anthem is the wind in her trees and the waves of her seas.

"BILLBOARDS IN SPACE" UPDATE
By: Earl W. Phillips, Jr

There is a movement underway to put a halt, before it even starts, to the concept of "billboards in space". This is the term used to describe any artificial satellite, launched into Low Earth Orbit and visible from Earth's surface, which carries commercial advertising.

The hullabaloo all started when a company in Roswell, Ga; **Space Marketing, Inc.**, proposed to launch a short-lived satellite to commemorate the 1996 Olympic Games to be held in Atlanta, Ga. Once the word got out, though, misinformation abounded and grew exponentially. Just about every major astronomical organization issued press releases stating their opposition and disgust to this proposal. All the reports I read said pretty much the same thing; a mile-long platform, as big and bright as the full moon, would circle the Earth, ruining everyone's night skies.

In actuality, the proposal from Space Marketing is quite different. In a telephone and fax interview I held with the company's **CEO Mike Lawson**, I learned that the proposed satellite was intended to carry a battery of ozone measuring instrumentation; would only be visible for about 10 minutes of each hour; and would be visible only during sunrise and sunset. According to Mr. Lawson, the reasoning behind the proposal is because "*the current instruments that monitor the ozone layer is nearing their useful lives. Our company has found a way to replace them at zero cost to the taxpayer. Commercial corporations would foot the bill*". Also, instead of a large, garish ad, the satellite would sport a logo that would be

meant to denote recycling, conservation, and other Earth-friendly concepts. "*Corporations interested in aligning themselves with these environmentally conscious concepts would purchase the rights to print this logo on their products and/or packaging*", according to Lawson. "*It seems sensible, in these days of sluggish economy and all the focus on reducing the deficit, to shift as much off the backs of the taxpayers as possible*", Lawson adds. "*Besides*", Lawson states, "*our company would never do anything to ruin the night skies*".

While the specific proposal that started all the furor seems harmless enough, the furor is justified. Imagine a night sky filled with a fleet of satellites in LEO, with brightly-lit messages such as "Eat At Joe's", instead of all those deep-sky objects we've all become accustomed to hunting down. As it turns out, even Congress has gotten into the act. A bill has been jointly introduced to both houses of Congress, by **Senator Jeffords** and **Representative Markey**, that would exclusively outlaw such usage of space.

Entitled the "***Space Advertising Prohibition Act***", it's purpose is to "*prohibit the use of outer space for advertising purposes*". The bill has a couple of problems, however.

First, and I think most importantly, is that the bill is dying a slow death on both floors due to lack of action. What with the recent budget battle, among other things, the only action the bills have seen is having been handed over to the *Committee on Commerce, Science, and Technology*, whose members have ignored it.

Second, and probably just as important, is the fact that the bill is rather poorly worded. Taken literally, the bill would outlaw even the commercial broadcasts that are being bounced off satellites and into our television sets. It is clear that more proper language is necessary if the bill is to have any hope of survival; it's opponents would have an easy job of killing it if it comes to vote as is.

Still, the concept is a good one. I for one have a hard enough battle against light pollution as it is with Earth-based lights. Therefore, I am mounting a campaign to get this bill through Congress (*hopefully, more properly worded!*). If you're interested in helping, send a large, self-addressed envelope and $2.00 (to cover copying and mailing costs), and I will send you a letter I have drafted to urge your local congress people to support the bill; a copy of the bill itself; and the names,

addresses and phone numbers of the Committee members so that you can contact them as well to express your opinion.

Let's get involved now, before it's too late to do anything about it!

***ed. note**: I know the article above reads like the one I wrote for the last issue, but the issue is an important one. Since I first learned of the possibility of such LEO satellites, I have been told that within the next 5 years there will be specific proposals to fly illuminated satellites carrying commercial messages, to be visible from Earth's surface. In my opinion, this cannot be allowed! As mentioned, there is legislation proposed that will kill this preposterous idea before it starts. Please, everyone contact your Senators & Representatives and urge them to support the bill & hurry up and pass it, with better wording, of course. A personal letter stating your position, along with your voter registration #, should cause some action!*

9/4/93 MEETING NOTES

The meeting began at roughly 10:05am. Those in attendance were Brown, Spellerburg, Campanella, Leeseberg, James, J & K Ayotte, Phillips, Stephens, Dixon, and Childers.

Leeseberg reports that he has been travelling around the country, helping children in need. He also donates $25.00 to the continued production of ***Signals*. Thanx Ron!**

Brown reports that the flat is now at 61 degrees, to observe the center of the hydrogen cloud we've been studying. The 8550 recently donated is now in Dreese, awaiting assembly. We purchased 2 new limit switches for the flat, there are 54 total. He is also testing his Doppler shift software.

Dixon returns from the conference in Santa Cruz, Ca on Bioastronomy. He reports that the **Argus** paper was well received; he will distribute copies to those associated with the **RO**, perhaps by including it in a mailing with ***Signals***. He also reports that a paper given by someone from the U of Indiana reports the discovery of radio signals from Glycine, a building block of amino acids, essential to life. He promises to write up a summary of the conference for inclusion in ***Signals***.

Phillips brings copies of the Westerville Astronomy Interest Group's newsletter for anyone interested. He also reports that **JPL** has effectively written off the Mars

Observer spacecraft, and has designated a panel of astro-luminaries to study the feasibility of another attempt at the red planet He also reports that astronomers using the **Hubble Space Telescope** have identified an "*X-Ray Burster*"; it is an interesting binary star in a globular cluster in Sagittarius. He brings photos supplied by **NASA** and the **HST** observing team to illustrate.

Ken Ayotte brings some electronics he has obtained for his home-built radio telescope.

James reports that he continues to work on the crane, and is experiencing some difficulties getting everything to function properly.

Childers reports that we suffered some blown fuses as a result of a recent electrical storm, and that he has been tweaking his "*Lobes*" software. Tests seem to indicate the tweaking is quite successful. He continues to gather data on the hydrogen doud.

Spellerburg offers to volunteer her assistance in any way she can be helpful.

The meeting broke at roughly 10:30am, with most assisting Russ in moving the copper screen room from the small storage pod to the large storage trailer, due to the fact that the groundhogs have evidently discovered it, and are nesting in it. Most attendees then went off to their respective tasks.

JPL MISSIONS UPDATE

09/01/93
From Ron Baalke
Organization: Jet Propulsion Laboratory
Forwarded from: PUBLIC INFORMATION OFFICE; JET PROPULSION LABORATORY; CALIFORNIA INSTITUTE OF TECHNOLOGY; NATIONAL AERONAUTICS AND SPACE ADMINISTRATION; PASADENA, CALIF. 91109.

GALILEO: The encounter with asteroid Ida was successfully completed on August 28, 1993. Scientific observations were recorded; preliminary analysis has verified the presence of an Ida image on tape. The playback opportunity at 40 bits per second will continue until late September and then resume in the spring of 1994. Galileo will go into Jupiter orbit and operate a probe in its atmosphere on December 7, 1995. Spacecraft condition is excellent, except that the high-gain antenna is still

only partly deployed; the mission team is planning to use the low-gain antenna for the Jupiter mission. Galileo was launched October 18, 1989, flew by Venus in 1990 and Earth in 1990 and 1992 for gravity assists, and flew by asteroid Gaspra in October 1991.

MAGELLAN: The spacecraft is now in a gravity-mapping orbit, with altitudes of 197 to 541 km (122 to 336 miles) from the surface of Venus. This orbit was achieved by aerobraking, an experimental operation carried out between May and August. Magellan's condition is very good, and precision tracking is providing desired data on the gravitational field. Magellan was launched May 4, 1989. It radar mapped more than 98 percent of Venus's surface from September 1990 to September 1992, and surveyed parts of the gravitational field from its elliptical orbit for the next 8 months.

MARS OBSERVER: The spacecraft's location and condition are not known. On Saturday, August 21, the spacecraft signal was not reacquired after a planned transmitter shutdown, part of the sequence for going into Mars orbit. Commands to the spacecraft have produced no response. Mars Observer was launched September 25, 1992, and was scheduled to enter Mars orbit on August 24.

TOPEX/POSEIDON: The satellite is healthy, and all scientific instruments are performing normally. The mission is mapping global sea level changes, reflecting seasonal warming and cooling and winds. TOPEX/Poseidon was launched August 10, 1992

ULYSSES: The spacecraft is in a highly inclined solar orbit, now about 38 degrees south relative to the Sun's equator, in transit from its Jupiter gravity assist in February 1992 toward its solar polar passages (about 80 degrees south and north) in 1994 and 1995. Spacecraft condition and performance are excellent, with Ulysses gathering data on the heliosphere — the realm dominated by the solar wind. The Ulysses spacecraft was built by the European Space Agency and launched October 6, 1990.

VOYAGER 1 and 2: The two Voyager spacecraft are continuing their Interstellar Mission, having remotely detected the heliopause, the boundary between the solar magnetosphere and interstellar space, for the first time recently. Voyager 1, launched September 5, 1977, is currently 8 billion kilometers (5 billion miles) from

the Sun after flying by Jupiter and Saturn in 1979 and 1980; Voyager 2, launched August 20, 1977, to fly by Jupiter (1979), Saturn (1981), Uranus (1986) and Neptune (1989), is now more than 6 billion kilometers (3.9 billion miles) from the Sun.

Albert Einstein, I Presume!

[Back to List of Issues in Volume 9] | [Back to List of Volumes] | [HOME]

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Designed by Jerry Ehman
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