CQ de WA2LQO

The official voice of the Grumman Amateur Radio Club
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COMMUNICATIONS SYSTEMS (Continued from June 2011)
By Bob Wexelbaum, W2ILP

Communications systems are limited in their performance by the available signal power, the ever present background noise, and the requirement to limit instantaneous bandwidth. The performances of the systems covered so far are in no way equal. Some methods are better than others. As hams we know that some methods are better for HF and others are better for VHF. We also know that propagation conditions can vary with frequency and with the need to work weak DX that can be close to the noise floor. There remains however the hypothetical question: - Is there a system, which we have not yet discussed, that is superior to all others? In other words: What is an *ideal* system, one not limited by engineering ingenuity or inventiveness, but rather the *intrinsic nature of the universe*? We may therefore attempt to define such a system by asking the following questions:-

1) What are the performance characteristics of such a system?
2) How, in principle, can such a system be realized?
3) How do the existing systems compare with that of an ideal system?

An answer to the first question leads us to the elementary concepts of *Information Theory* which was principally derived from the work of Claude E. Shannon. The second question leads to the subject of coding. The third question relates to optimizing the modulation method.

Any communication system must function in a way that conveys a sequence of messages from a transmitter to a receiver. The messages are selected from a *finite* number of *predetermined* messages. When you take a ham license exam you are confronted with multiple choice questions. The selections possible are usually a finite choice of one out of five possible answers. You cannot use your intelligence to answer with any but one of the finite five. In information theory there may be hundreds or thousands of possible message choices…but the point is that there are a finite number of choices, not an infinite number of choices. Thus within some time interval only one of the possible messages may be transmitted. The receiver does not know which one, but it knows how to decode all of the possible ones. The possible messages are predetermined, like limited multiple choices, and this means that they are determined *a priori* so that they will be recognized by the receiver. During the next time interval either another message is sent or the same message is sent again. The job of the receiver is thus simplified. It does not rely solely on the ability to separate the signal from the background noise, but only needs to identify which possible message is being transmitted. It is not the job of the receiver to answer the question "What was the message?" but rather the question, "Which one?' Another factor to consider is that in most systems the probability of receiving a specific message may differ. This is like the probability that the letter "e" is greater than other letters in English text. The differing probabilities can also be known to the receiver. This gives the receiver some favorable odds in guessing which message has been sent, for example, during a noise spike. When we take multiple choice tests we may sometime guess the correct answer. Our odds of guessing correctly may increase if we can eliminate one or two of the five answers. We spoke about *quantization* before and recognizing a transmission is thus nothing more than the extension of the quantization which means a finite number of level steps that can be determined at each sampling time. The discrete predetermined messages consist of those quantization levels which may be transmitted directly or encoded into any one of a number of forms. We must note that such quantization imposes no restriction on the precision with

which an arbitrary signal may be transmitted, since the number of quantization levels may be unlimited.

We may be free in our interpretation of the term "message". For example, let us suppose that during some time interval there is generated by the transmitter one of a number of predetermined waveforms. If the receiver correctly identifies the waveform, then the message has been received. As an example, let us suppose that a quantization level is encoded into a binary waveform as a binary PCM (pulse code modulation). We can then view the quantization level as a message, but we can also view each binary digit as a message. This means that a number of messages conveyed by a succession of binary digits may convey the single message conveyed in one quantization message.

The concept of *amount of information* is so important to our present study that we must use a simple defining equation to evaluate it.

Considering a communication system in which the allowable messages are: *m sub 1, m sub 2…,* with the probabilities of occurrence *p sub 1, p sub 2,…*

Remembering how probabilities work, we know that *p sub1 + p sub2* +… = 1. If we transmit message *m sub k,* of probability *p sub k* and assume that the receiver has correctly identified the message, we will then say by definition of the term *information,* that the system has conveyed an *amount of information I sub k* given by;

I sub k = log *base 2* 1/*p sub k*

While *I sub k* is an entirely dimensionless number; It is a "unit" by convention called the *bit.* This may seem confusing so let us look at an example. If *p sub k* = ¼, *I sub k* = log *base 2* 4 = 2 bits. The unit bit is used to remind us that the equation is log to the base 2 also known as the natural log or *nat.* When base 10 is used then we use a unit called the *Hartley* or *decit.* The use of such units in the present case is analogous to the unit radian used in angle measure and decibel with power ratios. Base 2 usage is convenient for working with PCM. For example if the two possible binary digits (bits) may occur with equal likelihood, each digit conveys an amount of information *I* = log *base 2* = 1 bit.

(To be continued)

PRESIDENT'S NOTE by ED GELLENDER, WB2EAV

Field Day worked out quite well for us. We had two stations with fifteen participants. We worked CW and SSB on 40 meters, as well as SSB on 20 and 15, for a total of 547 contacts.

This year, in our new location, we were on our own to raise the 20 and 40 meter dipoles up in the trees. My vote for MVP (most valuable player) is Bill N2SFT, because he brought along his super-special antenna stringing tool. It is a serious slingshot that wraps around your wrist and uses a rubber hose instead of a band. What catches your attention is the fishing reel bolted onto it. Bill used the slingshot to launch a fishing sinker and monofilament line way up into the trees. When the sinker came down, we tied on a string and reeled it back in. Then we used the string to pull the antenna ropes up, and finally the longwire antennas.

I noticed that the sunspot numbers this cycle are not quite as high as some prior ones I recall. The bands were OK, but working DX with a few milliwatts just doesn't happen like it used to. I have read that this cycle seems to be a bust, with experts scratching their heads. Some deny that global warming is caused by humans, despite the evidence. Well, I can tell you, for better or worse, that there is no evidence at all blaming humans for this one. We can mess up the planetary environment, but the Sun is still way out of our league.

The next event coming up is the picnic that will take the place of our August meeting. It will be from 4:30 to 7:00 PM on Wednesday, August 17th, at Syosset Woodbury Park, the same place as the last two years. All members, spouses, etc. are invited and the food is free. If you plan to attend, please contact Jack Cottrell WA2PYK at (516) 249-0979 or jjcottrell@verizon.net so he can get a head count. The entrance to the park is on the south side of Jericho Turnpike (NY25) about half a mile east of the NY 135 Expressway (opposite the Fox Hollow Country Club). Bear right as you enter and you will pass the picnic grove to your left on your way to the parking lot.

Ed, WB2EAV

GRUMMAN AMATEUR RADIO CLUB
MINUTES OF GENERAL MEETING 6/15/2011
By Karen, W2ABK, Secretary

The meeting was called to order by Jack at 5:30 PM

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TREASURER'S REPORT – Ed, WB2EAV

Finances continue to be in good shape.

REPEATER REPORT – Gordon, KB2UB

The Bethpage repeater is noisy.

NET REPORT – Karen, W2ABK

Thursday night net at 8:15 PM on 146.745 MHz had one check-in..
Thursday night net at 8;30 PM on 145.330 MHz had a nice turn out.
Sunday morning net at 7:30 AM on 7.289 MHz had a nice turn out.

VE REPORT – Bob, W2ILP

Three applicants: 1 passed Technician & General exams, 1 upgraded to General, 1 Failed Technician.
Six VEs were present: W2ABK, AB2EF, AB2ZW, WB2EAV, WB2IKT, and W2ILP.

OLD BUSINESS

We need programs and guest speakers for our meetings.

NEW BUSINESS

Discussed Field Day. We will operate as a 2A Category Station.

PROGRAM

Bert, K2DOD is moving to California. He gave away his ham equipment at the meeting. We will miss him and we wish him all the best of luck and happiness. His new address is:-

Bert Wengler, K2DOD
3312 Dorado Place
Carlsbad, California 92009
e-mail: NMWPGK@aol.com

The meeting was adjoined at 6:30 PM.

GARC NETS: 40 Meters: 7.289 MHz at 7:30 AM EST Sundays
Net Controller: Eugene, W4JMX
2 Meters (repeaters) Thursdays: 146.745 MHz (-600 kHz) at 8:15 PM 145.330 MHz (-600 kHz) at 8:30 PM. Tone for both repeaters: 136.5 Hz.
GARC Net Controller Karen, W2ABK
ARES/RACES NETS: Mondays.

MEETINGS General Meetings of the GARC are held on the third Wednesday of each month, starting at 5:30 PM, at the Ellsworth Allen Park in Farmingdale. Driving directions and map can be obtained from http://www.mapquest.com. It is suggested that the GARC web site be checked to be certain of meeting location, which may change after this newsletter is distributed. Board meetings are held a week before the General Meeting at the Bethpage Skating Rink.

WEBSITE The GARC web site can be found at http://www.qsl.net/wa2lqo . Webmaster is Pat Masterson, KE2LJ. Pictures of GARC activities, archives of newsletters, roster of members, and other information about the GARC may be found there.

INTERNET LINK OF THE MONTH FOR INTERNERDS

In this age of home computers it is possible to see video demonstrations in our own homes that were once seen live in college lecture halls or from films or tapes at technical engineering meetings or ham club meetings. Here I will give you a link to a mechanical demonstration of wave theory. I wish I had had this presentation to show to a physics class I was teaching wave theory to at La Salle Military Academy (where I had only a jumping rope), or at the old GARC meetings, where I didn't have a rope. This mechanical analogy explains not only wave peaks and nodes but resonance, impedance matching and SWR. Watch it all because it gets better toward the end. The link is:

http://techchannel.att.com/play-video.cfm/2011/3/7/AT&T-Archives-Similarities-of-Wave-Behavior

AT&T has a website where they have a number of legacy Bell Labs demonstrations. This particular one was filmed in 1959, long before Bell separated from AT&T. It is every bit as relevant today. The excellent and famous lecturer is Dr. John N. Shive, credited with inventing the photo transistor before Forest Mims found practical uses for it.

Now that I have been introduced to the AT&T Archives, perhaps we can find other technical lectures there that would be applicable to ham radio technology. You won't need to burn gas to get to club meetings to see this stuff if you have a working computer.

You may now watch Wave Behavior without making your own waves or complying with Robert's Rules of Order on your own time. Wave theory will never change; Continuous waves don't separate. Maybe after you see this for yourself you will have a better understanding about what antenna tuners are supposed to do and will no longer debate the difference between antenna tuners and antenna couplers.

[I saw the video. Every ham should see it! Bob really found gold here. – WB2EAV]

PUZZLES

Last month I asked you to identify two men. Here are the questions and their answers.

1) Who is the man who wrote more electronics books and articles, about electronics projects which "do-it yourself" amateurs could experiment with, than any other man could ever claim to have authored? He isn't a ham and he doesn't believe in Darwin's theory of evolution or in Global Warming.
   Answer: Forest M. Mims III. (1944 – pres.)
2) Who is the man who edited and sold magazines for hams that competed with ARRL's QST? What is his call sign? He never changed his call when he moved to a different call district in the days when everyone else who relocated to a different district had to apply for a new call sign.
   Answer: Wayne Green, W2NSD/1 (1922 – pres.)

The puzzle for August 2011 is to again identify a man.

On 4/15/2011 a famous ham who founded World Radio Labs (WRL) became a silent key at the age of 100. What was his name and call sign?

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1 Yr. Board Member: Dave Ledo, AB2EF
1 Yr. Board Member: Bob Christen, W2FPF

Newsletter

CQ de WA2LQO is published monthly by the Grumman Amateur Radio Club for its members and friends. Editor: W2ILP 631-499-2214 W2ILP.RADIO@gmail.com This is new E-mail address.
Contributing writers: All GARC members (we hope). To submit articles or ham equipment advertisements contact the editor. Articles will only be edited when permission is granted by the author.

GARC Webmaster

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GARC VE Exams

We normally proctor exams for all classes of ham licenses on the second Tuesday of each month, starting at 5:00 PM. The exams are given at Briarcliffe College, 1055 Stewart Avenue, Bethpage, NY in room: Long Beach #5. Ham Exams are: Element 2 – Technician, Element 3 - General, Element 4 – Amateur Extra Class. All applicants must pre-register by contacting W2ILP. Time and location of exams are subject to change. If there are no applicants VE sessions will be cancelled. The fee for 2011 is $14 for all exams taken at one sitting. New first time applicants should be aware that their Social Security Number will be required on the application form unless they register with the FCC for an FRN. Applicants for an upgrade should bring their present license and a photocopy of it. All applicants should bring picture ID such as a driver's license. Study material may be bought from the ARRL-VEC or W5YI-VEC http://www.arrl.org or http://www.w5yi.org All VECs use the same Q & A pools. **On July 1, 2011 the General Class Exam Question Pool changed.**

Commercial FCC Radio Operator Exams

We are certified by the National Radio Examiners to administer exams for all classes of FCC commercial radio operator and maintainer exams. All Commercial Operator License Examiner Managers (COLEMS) use the same commercial license pools. Administrating fees vary. For information or to register contact W2ILP.

Editorial

My gas clothes dryer failed to heat up and I decided to repair it. I downloaded the manual for the dryer and started to take it apart. I also read that the most common failure occurs when a thermal fuse overheats and burns out. The fuse was located in a place that required major disassembly to get to, as well as disconnecting the gas line and the exhaust tube. The fuse checked OK on an ohmmeter. The remaining parts which might have been the cause of trouble would cost almost as much as a new machine, so I gave up, put the dryer back together, and ordered a new and better machine from Sears (plus installation). If it wasn't for my technical knowledge, I would have ordered a new one in the first place; Sometimes it pays to be ignorant.

Heathkit never made clothes dryers, and many appliances aren't exactly designed to be easily serviced. As one grows older priorities change; You even have to hire professionals to mow your lawn. After years of "do-it-myself" penny pinching I must remember what Dirty Harry said…"A man's got to know his limitations."
--73, W2ILP (Immediately Laundered Priority)…Wet wash.--

Grumman Amateur Radio Club
Sixty Seven Years 1944-2011
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FIRST CLASS MAIL

Do Not Delay

RADIO'S BASIS AND PURPOSE

I have talked about the subject of the basis and purpose of ham radio in the past and how it had been envisioned in the FCC Part 97 rules. In my opinion, none of the purposes that are detailed are now entirely applicable in the same way that they were in 1951, when I was first licensed. One of the major differences today is that hams are not the only civilians capable of mobile two way radio communication. Most hams use cell phones themselves rather than ham radio VHF/UHF mobile rigs or HTs. There is more RF bandwidth existing than is now needed, even in populated areas. More frequencies are, however, expected to be needed for future expansion of the uses of the radio spectrum. Investors expect future needs to increase or they would not be willing to bid for more frequencies. Our government makes frequencies available to be bid for by various commercial services. In addition, for example, the government itself expects there to be a future need to expand the aeronautical bands that are governed by the FAA. Do hams really need all of the bands that they are now licensed to use? This is not as simple a question as it might appear to be at first. We must, in my opinion first think as citizens of the USA, then as sensible people with radio communications experience…and finally as ham hobbyists. Last month I related the news that a group of local hams had personally visited Congressman Peter King and asked that a ham band not be placed on bid for commercial use. Now one might expect the ARRL to appreciate the initiative made by the local hams…but no…some of the ARRL staff did not. The ARRL prefers that hams work through the ARRL's paid lobbying staff, without contacting politicians or petitioning directly…because the ARRL thinks not as citizens of the US, not as radio communicators, not even as hams, but as publishers of ham radio literature and advertisers of ham radio products. Hams are the only radio operators who are permitted to design and build their own radio transmitters…but few do. Ham Radio may be our pleasure but it is the ARRL's business. ENUF SED. –w2ilp (I Lost Purpose)—but not privileges.