CQ de WA2LQO

The official voice of the Grumman Amateur Radio Club

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COMMUNICATIONS SYSTEMS (Continued from October 2011)
By Bob Wexelbaum, W2ILP

Readers have stated that they find it difficult to follow the mathematic approach to communication theory that this series has taken us to. Because of that I have decided to skip much of the remaining stuff in communications texts that deals with Information Theory and move on to another sub topic that is very important in the design of communications systems. That is the subject of coding.

The object of coding is to devise codes that will transmit information at a rate which will take advantage of the full capacity of a channel as nearly as possible with minimum likelihood of error. Codes other than Morse Code or simple binary code can be devised that will permit us to detect errors in transmission and in some cases to even correct such errors. Coding accomplishes these purposes through the deliberate introduction of *redundancy* into the messages. For example, if each message was to be transmitted by binary digits, it can be shown that M binary digits per message are required. If, however, the original M quantization were binary-encoded, then only $N = \log_2 M$ binary digits are required. The excess number of binary digits required is $M - N$. Hence the coding will produce a redundancy of $M - N$. A better way to explain this would be to give as an example the 4-bit binary-coded-decimal (BCD) which uses only ten of the possible 16 combinations, where hexadecimal code uses all 16 possible combinations. The BCD interpretation represents 0 through 9…..but then there are 6 possible redundant codes remaining. The hexadecimal bits numerically weighted 10 through 15 (also referred to as A through F) are redundant in BCD.

0000 = 0, 0001 = 1, 0010 = 2, 0011 = 3, 0100 = 4, 0101 = 5, 0110 = 6, 0111 = 7, 1000 = 8, 1001 = 9
1010 = A, 1011 = B, 1100 = C, 1101 = D, 1110 = E, 1111 = F

Redundant codes may be used to check the number of ones in a previous BCD coded number. "A" could mean that the number of ones was even (or zero) and "B" could mean that the number of ones was odd. Modern day computers use 8, 16, 32 or 64 bit codes, so that this BCD example is trivial. Even though longer code words might have more unused permutations available, they are not usually used for error checking. Unused code permutations are now usually held open for future possible applications. Modern computers operate with faster clocks, faster sampling rates, and faster processing, thus there are capabilities for not just redundant bits but redundant words.

Another method of error checking is to transmit each bit of a code three times. When we transmit a stream of binary digits, our concern is to not confuse a 0 for a 1, or a 1 for a 0. Suppose that we repeat each bit three times: 000 for 0, and 111 for 1. The triplets of 1 and 0 are redundant because two of them add *no information* to the message. Suppose, however, that the signal-to-noise ratio on the channel is such that we can be certain that not more than one error will be made in a triplet. Then if we receive 001, 010, or 100, we would be confident that the transmitted message was actually 000, while we can correspondingly assume 011, 101, or 110 actually are 111. Redundancy, *deliberately introduced*, has enabled us to detect the occurrence of an error and even correct the error. Redundancy, however, cannot *guarantee* that an error will be either detectable or correctable, because errors are caused by the *unpredictable* random nature of noise. While the noise level may be low enough that more than a single error is *unlikely*, there is always a finite possibility that two errors will

occur. In this case we would know that an error has occurred but would read a 0 as a 1 and a 1 as a 0. In the worst case, there remains the possibility, however small, that three errors have been made. In this case not only would we misread the digit, but we would not even suspect that an error has been made. We may thus conclude that while triplet coding may allow a great deal of error detection and correction, it ordinarily cannot detect or correct all errors. A feature of triplet redundancy is that not all sequences of symbols constitute a bona fide message. A triplet of binary digits can produce 8 possible combinations. Only two combinations 000 and 111 are recognized as words which convey a part of a message. The remaining combinations are not in our a priori *dictionary.* Because certain words are not in our dictionary, we are able to recognize them as errors. Corrections are made on the basis of a similarity between unacceptable and acceptable words.

I am now using software called MS WORD 2010. Among its features is the ability to correct the spelling of English words. This sort of spell checking could also be used to correct text that is to be transmitted by a channel via wire or radio, prior to transmission or later during reception. For example, suppose that on a page of printed text we encounter the word *ekpensive.* We would know that there has been an error because there is no such word. If we judge that the error is most likely to be only one letter, we could recognize the word as *expensive.* It is, however, possible that more than one letter was erroneous and the intended word was, say, *offensive.* In this case the proper correction would not be made automatically.

In languages, redundancy extends beyond the combination of letters in a word. It extends to entire words and beyond to phrases and even sentences. For example, if we transmit the sentence, "The Army has launched an ekspensive", we would recognize that ekspensive was meant to be offensive, even though three letters are in error. In this case we would be taking advantage of the redundancy in the sentence. We must be careful to turn off the error correcting if we intend to send anything that is not in the dictionary or does not make sense, even though it is technically redundant, such as *Internerd,* cryptograms, or poems such as Lewis Carroll's "Jabberwocky". We cannot reject words that are too offensive or too expensive because they are not redundant. That sort of rejection would have nothing to do with coding errors. It is usually a matter for editors, censors or personnel managers to judge. (;0)) (to be continued)

PRESIDENT'S NOTE by ED GELLENDER, WB2EAV

We have one of the year's major club events coming up soon – the annual holiday party in place of the December club meeting. The dinner will start between 5:30 and 6:00 PM on Wednesday, December 16th. Save the date. We are trying something new this year. We will be meeting at Kwong Ming Chinese Restaurant in Wantagh. A number of us have eaten there and enjoy their family dinner. Everybody gets soup, eggroll (or other appetizer), dessert and all the tea you can drink. There is then one entrée platter per person, eaten family style with everybody sampling. You know – the usual stuff, like spare ribs, shrimp with lobster sauce, General Tso's chicken, etc, - quite nicely done - for about $27 (including tax and tip; bar extra). It is located at the southwest corner of Wantagh Ave. and Jerusalem Ave. (NY105). Take the Southern State to exit 28-S, then ½ mile to Jerusalem Ave. (NY-105-W). Turn right, then a quick left into the lot. Alternately, take the Seaford – Oyster Bay Expressway (NY135) to Jerusalem Ave. (NY105-W) (first exit South of Southern State) and go ½ mile, just past Wantagh Ave. to the restaurant on the left.

Let me tell you how ham radio helped me in an unusual way. Two data radios on an airplane can be connected to test each other without radiating power. Two Dow-Key coaxial relays are used plus attenuators to reduce power. One plane was driving me crazy. In the self-test mode, no data came through, and one transmitter had high SWR. The antennas are bypassed; How can an attenuator give you bad SWR? The usual approach would be to drive a 90 pound $30,000 network analyzer there and lug it out to the plane. Fuggedaboutit. I realized what I really wanted was one of those MFJ antenna analyzers, but these radios work at a higher frequency than anything that MFJ makes. Then an idea hit – Attenuators are quite broadband; frequency doesn't really matter. George, WB2IKT arranged for JoEllen KD2AEY to lend me a MFJ-259. I wrapped my clothing around the unit and a few tools, stuffed it all into a small bag, and checked it with the airline. I felt silly checking a bag so much smaller than what everybody else routinely drags on board, but I knew that they would never let me carry it on with me. When I got to my destination it worked great. I quickly found one coaxial relay that as the NO contact closed, the NC contact didn't open. Quite pleased how it worked out.

73, Ed, WB2EAV

GRUMMAN AMATEUR RADIO CLUB
MINUTES OF GENERAL MEETING 10/19/2011
By Karen, W2ABK, Secretary

TREASURER'S REPORT – Ed, WB2EAV

Finances continue to be in good shape.

REPEATER REPORT – Gordon, KB2UB

146.745 was noisy.

NET REPORT – Karen, W2ABK

Thursday night net at 8:15 PM on 146.745 MHz had no check ins.
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 moved up in frequency but had only one check in.

VE REPORT – Bob, W2ILP

Two applicants applied. Both successfully upgraded to General Class. VEs were Gheorghe, AB2ZW, Karen, W2ABK and Bob, W2ILP.

OLD BUSINESS

Elections coming up at the November general meeting.

NEW BUSINESS

Gordon reported that the annual Coast Guard Field Day is October 22nd. K2G will be operating from Fire Island.
We need programs and guest speakers for our meetings.

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.

SILENT KEY

We note with sadness the passing of Eugene J. Reilly K2IFB, of Jericho, NY. Gene passed away on October 19th, at the age of 73, from a heart attack. He had worked on the LEM and space shuttle projects. After leaving Grumman Gene had worked for Cablevision. Gene was an active member of the GARC and an active Field Day participant. He had upgraded to Amateur Extra Class at a GARC VE session in 2009.

INTERNET LINK OF THE MONTH FOR INTERNERDS

The Internet link for this month was suggested by Dave Ledo, AB2EF. It is a brief history of the radio shack that was alleged to be used by Marconi in early failed attempts for trans-Atlantic communication from Long Island. Actually it is not known for certain if the shack was ever used to transmit or receive radio signals, but it is believed that it was used to train Morse operators. There are photographs which show Marconi posing in front of the shack. The Radio Central Amateur Radio Club (RCARC) now uses the shack twice a year as a ham station to commemorate both Marconi's birthday and his first success, although it occurred elsewhere. They use modern ham equipment, obviously unlike what would have been used by Marconi. The RCARC normally meets in the New Village Recreation Center in Centereach at 7:30 PM on the last Wednesday of each month. The President is Neil Heft, KC2KY. Neil would be the man to contact if you wish to visit the shack or operate from it on either of the commemorating days. His e-mail address is: kc2ky@arrl.net or rcarc@kc2ky.org

The Internet link of this month is:
http://li-ruins.com/index.php?option=com_content&task=view&id=41&Itemid=99999999

PUZZLE
This month I will give you another cryptogram to solve.

MDV LPVAOQLGE LAV QVAMLOGWZ DVAB - FBAEDOJVAE, LGC LWFLZE MLNV

MDVOA DVABVE HABP MDV QAOPOGLW QWLEEVE. –BEQLA FOWVC—

The solution for the September 2011 cryptogram is:

THE AMERICAN SYSTEM OF OURS GIVES EACH AND EVERY ONE OF US A GREAT OPPORTUNITY IF WE ONLY SEIZE IT WITH BOTH HANDS AND MAKE THE MOST OF IT.
--AL CAPONE—

REVISITING MONTE'S GOATS

You may remember that I wrote about a famous puzzle that is known as the Monte Hall Paradox. It has been included in an Artificial Intelligence course and textbook. If you don't remember the paradox; it initially involved selecting one of three doors that had either a desirable automobile or one of two undesirable goats behind it. The contestant decides to select door number one…but before he can open it, Monte opens up door number two, exposing a goat. There are now two doors left and the puzzle asks should the contestant switch by opening door number three instead of door number one? You might think that there is a 50:50 chance of getting the car by opening either of the two remaining doors…but no. The contestant should switch by opening door number three. Door number one has only 1/3 odds of having the car, but door number three has 2/3 odds of having the car. This solution has been confirmed by Lawrence A. Denenberg of Harvard's Aiken Corp. Laboratory in Cambridge, MA.

In order to use Monte Hall's name in the AI textbooks, Monte was contacted by the Mr. Denenberg. Monte gladly granted permission to use his name, but admitted he did not understand the puzzle's solution at all.

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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. (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.

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

Halloween was very quiet in my neighborhood this year, with very few "trick-or-treaters". There might be some demographic or sociological reason for that but I won't attempt to muse about it here.

As of the time I am typing this (November 2nd), there has been only one applicant who registered to take a Technician test at the scheduled November VE session on November 8th. I hope that we get more registrants, because it is a shame to have to get VEs to attend a session with only one applicant.

Dr. Steve Sherman is a medical doctor who had taken ham exams at our VE sessions. He has now upgraded to Amateur Extra Class, changing his call sign from KC2BWN to NC2NY. He has been certified as a VE by W5YI-VEC and has offered to help at our VE sessions. He normally works at a hospital until 5:00 PM, but might leave earlier if we needed him urgently. I told him that there will probably be no urgent need for him to attend the November session.

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TELEGRAPH POLES
By W2ILP

When Samuel Morse ran the first telegraph line from Washington, D.C. to Baltimore, MD he had intended to run the line underground, but the process of burying the line and keeping it insulated became so expensive that he invented the telegraph pole; the least expensive way of running the telegraph wires above ground. Morse thought that his telegraph poles would be only a temporary method, but soon the entire nation was wired and the wires were almost always mounted on poles. They often ran alongside railroad tracks, but also ran through the center of many small towns and medium size cities. The lines, as well as the railroad tracks, often served as de facto borders between the more affluent areas and the poorer ones. So we get the expression "…Living on the wrong side of the tracks", which might more appropriately have been on the wrong side of the telegraph wires. As time went by, the telephone was invented, and the cheapest way to wire the nation for telephone service usually was to add them to the telegraph poles. Next, high voltage power distribution lines and transformers were added to the tops of the poles. Eventually, coax cables went on the poles for TV distribution and then Internet services. Finally fiber-optic lines joined all the other lines on the poles. By this time the poles were eyesores. Only the most metropolitan, luxurious or wetland areas could use underground wiring.

There was recently a freak snow and windstorm here on the east coast. The leaves had not yet fallen and snow overloaded many trees so that they fell against the poles, bending or breaking them, snapping the wires. Many were left without electrical power and other utilities. What had Morse wrought? His "temporary" poles are now permanent swords of Damocles all over our nation! Electrification and communication technology have changed the standard of living for everyone, but nobody has invented a cheaper way to run wires to this day than the lowly but towering telegraph pole.