



HARMONICS

1916

South Jersey Radio Association

2014



Storm Robotics 2014 Season

Build season kicked off for Storm Robotics on Saturday, January 4th, 2014. That date kicks off the busiest six weeks of our year, when we have to build a robot for a task defined by FIRST (For Inspiration and Recognition of Science and Technology). This year's game is Aerial Assist. The goal of the game is to throw a ball that has a two foot diameter and is covered in a red or blue nylon covering, into either a high goal or low goal. Three different robotics teams join together to form an alliance. Alliances compete against one another to score the most points.

Build Season wrapped up on Tuesday, February 18th, known as Stop Build Day. By then we finished our robot. Our team, after taking name submissions from the public via Twitter and Facebook, voted to name this year's robot Fonzie.

On March 1st-2nd, Storm participated in its first competition of the year, at Hatboro-Horsham High School, in Horsham, PA. Storm finished with the 18th seed out of 40 total robots. We also managed to make the playoffs at the competition, where we finished as quarterfinalists.

Storm would love to have supporters present at our next competition, at Seneca High School on March 22nd-23rd. There you'll see our catapult in action! All are welcome to attend. If we do well enough there, we might advance to the Mid-Atlantic Regional competition in Lehigh, PA in April.

If you'd like to keep tabs on Storm, and see what we're doing, you can check out our website at: storm.lrhhsd.org. Also, Storm has a strong presence on social media - we maintain a Twitter and an Instagram account as well (@stormroboticsnj).

Storm loves to have the support of the South Jersey Radio Club - we'd love to be able to demonstrate Fonzie to you after the season concludes in late April.

The picture above is our team after a Critical Design Review at Lockheed Martin

If you have not paid your 2014 dues, this will be the last issue of Harmonics you receive. Please send your dues check payable to "SJRA" to:

Ray Golley, Treasurer
552 Newport Road
Millville, New Jersey 08332

SOUTH JERSEY RADIO ASSOCIATION

HARMONICS is published monthly and is the official news letter of the South Jersey Radio Association. The SJRA was established on June 16, 1916 and has been meeting continuously since its inception. The club has been affiliated with the American Radio Relay League since 1920.

The SJRA meets each month on the fourth Wednesday, January through September; and usually the third Wednesday, October, November and December; in one of the Meeting Room of the Gibson House at 525 East Main Street, Marlton, NJ 08053. Visitors are always welcome at our general meetings. **“Our Meetings are Smoke Free”**

SJRA operates the K2AA Repeater (145.290 - PL 91.5) located in Medford, NJ and the K2UK Repeaters (146.865 and 442.350 - PL 131.8) located in Pine Hill, NJ. The repeaters are open for use without restriction to all licensed amateur operators.

There are currently over 100 SJRA members active in most all aspects of amateur radio. Membership is by application and is subject to the approval of the Board of Directors. Club dues are currently \$30/yr. for memberships, \$22.50/yr for retired-person membership (62 plus 1 yr membership), and \$15/yr. for additional family members and student membership. Membership information is available on the K2AA Repeater or from Mary Von Lintig, KV2M, 856-772-6475

EMAIL: [sjra at sjra dot org](mailto:sjra@sjra.org) SJRA's web page www.sjra.org
 Mark O'Brien, K2AX, is the SJRA/ARRL VUCC card checker
 Joe Fisher, KC2TN, is the SJRA/ARRL WAS card checker

 ★ **Harmonics** is now available on the WEB in pdf format at: ★
 ★ <http://www.sjra.org> ★
 ★ **South Jersey ARRL Section News** is available on the WEB at: ★
 ★ <http://www.arrl.org/sections/?sect=SNJ> ★

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Contests: Jon Mac Millan, W2MC
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Publicity: Debbie Pullaro, W9QWN
Picnic: Debbie Pullaro, W9QWN
Ways & Means: Ray Golley, N3RG
Property: Jon Mac Millan, W2MC

Harmonics Staff:

Publisher/Editor: Ted Groke, W2TAG
Alternate Editor: **Vacant so please volunteer. I will teach you all you need to know.**
Circulation: Mary VonLintig, KV2M;
 Jim Vecchiola, KR2T

LOCAL WEEKLY NETS

Monday	K2AA, Medford	145.290 @ 8PM
Thursday	Various Locations	28.405 @ 8PM

Harmonics Deadline

Articles submitted for the next HARMONICS will be accepted until Monday, April 7, 2014. Email: [ted.w2tag at gmail dot com](mailto:ted.w2tag@gmail.com)

SWAP SHOP - For Sale/Wanted ads are free of charge and are accepted for Amateur Radio related items only. While ads are not restricted to SJRA members, there is only limited space available and members have priority for listings. No items will be accepted for inclusion in the Swap Shop from commercial vendors or traders. All ads must be submitted at least three weeks prior to the scheduled SJRA general meeting date.

GENERAL ADVERTISING - Limited commercial advertising is accepted on a space available basis. Annual advertising rates range from \$25/yr (Min 1/8 page) to \$200/yr (Full Page). Information is available from Ken Botterbrodt, K2WB.

Meeting Minutes

General Meeting of 2/26/14

The meeting was held at the Gibson House in Marlton, NJ, opened at 1935 by Ray, N3RG. We saluted the American flag. All members were requested to introduce themselves. Lou, N2HQL/Matt, W2MAT, made a motion to accept the minutes of the January meeting as printed in Harmonics.

Ray, N3RG, made the treasurers report, It was accepted on a motion by KR2T/N2ATB.

New members by Mary, KV2M: Brian Gross, KD2FJX; David, KD2DQF; Chris Pycik, KD2FHA.

Historian, Mary, KV2M, showed a hamfest version of Harmonics from 1959 and a 1935 list of ARRL affiliated clubs in the Philadelphia area.

Programs: Feb- estate/white elephant sale; March- Ray, N3RG, to review " Roll Your Own Antennas"; April or May- Storm Robotics Team.

DX report by Jack, N2VW: ARRL DX phone contest March 1 and 2; 3C- Annobon Island until March 8; 9H- Malta until March 6; 3D2- Fiji Island March 11 thru 14 April; 9K- Kuwait until 28 Feb; T6- Afghanistan N3HU as T6RH; T8 Palau T88QX 8 thru 15 April; V6 Micronesia V650XG 9 thru 15 May.

Nets by John, WY2J: 2 meters ok, repeater died 2/2. Still need two net control operators for 10 Meters or we will be forced to cut to twice monthly.

Repeaters Joe, KC2TN: Problems seem to be topside-need professional climber.

Club Stuff: Still taking orders

Web team: Still moving to new servers.

No Old Or New Business.

Board Meeting of 3/5/14

Present Were; N2HQL, KV2M, KV2R, KR2T, AC2FO, and KM2KME. On phone was K2WB, allowing for a quorum. Open at 1930 at the Gibson House in Marlton, NJ. Motion to accept February Minutes by N2HQL/KM2KME passed .

Proposed members by Mary, KV2M; Ray Smith, KD2FMX, and Leonard Warren, KD2FMV. Both were accepted.

Corresponding Secretary: No report.

Programs: as above. K2WB will do a program on VHF Mountain Topping in October.

Health & Welfare: All cards will be out by the end of the month, no new illness reported.

No old business. New Business: Ken, K2WB, has received requests for demos from Rice and Demasi schools. He will make arrangements. The meeting was ended as Ken had to return to work and we adjourned lacking a quorum to continue.



HAM TECH

Vol 5 No. 3 by John - WY2J

wy2j at arrl dot net

Digital Signal Processing

Part 3 of 4: The DFT and FFT Filter

Introduction - Last month we explored the FIR implementation of a digital filter with a reasonably sharp cutoff and good stop band rejection. On the down side it took over 16,000 real multiplications and a very large number of additions to form just a single filter. What if we wanted to process multiple filters to look at the pile up responding to a rare DX station working split. We certainly want to do it in real time so re-tuning the VFO isn't going to work very well. We could build an FIR filter for each channel but that is a lot of expensive hardware. There are other ways to build digital filters, lots of them, based on the Fourier Transform.

The Fourier Transform was invented by Joseph Fourier (1768 to 1830) to aid in the mathematical analysis of heat engines. In his day steam engines were new and high tech. It is fortunate that his mathematics could also be used to transform the time dimension to the frequency dimension and vice versa in electrical systems. This is filtering. But Joe's math didn't recognize sampled data systems because digital hadn't been invented yet. A few modifications and the Discrete Fourier Transform (DFT) came into being allowing us to build multiple digital filters in real time. But the DFT has a problem when we try to build a large number of filters. The number of complex multiplies is equal to the square of the number of filters. Thus for a 1000 filter bank of 500 Hz BW each covering the 80 meter band, we need a million complex multiplies or 4 million real multiplies and of course all those additions. It gets big fast.

Mathematicians had recognized that the DFT had many symmetries or redundant calculations of the same data and in 1965 Cooley and Tukey published their famous paper that showed how to eliminate these redundancies. The Fast Fourier Transform (FFT) was born. The number of complex multiplies needed is given in Equation 1.

Equation 1, $N_{CM} = (N_F/2) \log_2 N_F$

Our 1000 filter example could be reduced to $(1024/2) \log_2 1024 = 512 (10) = 5120$. This is a reduction by a factor of over 195 to 1. The FFT algorithm displaced the DFT overnight even though it is limited to filter numbers in binary step sizes.

The DFT Algorithm - Even though the FFT is much more efficient than the DFT in calculating all but the smallest number of filters, the FFT does the same fundamental calculations as the DFT but differs only in the sequence of calculations to avoid all those redundancies. Equation 2 below is the math description of the DFT in complex number system format.

$$X(k) = \sum_{n=0}^{N-1} x(n) \cos\left(\frac{2\pi nk}{N}\right) - j \sum_{n=0}^{N-1} x(n) \sin\left(\frac{2\pi nk}{N}\right)$$

Equation 2, DFT Computation Algorithm

The frequency bins $X(k)$ extend from 0 to $N-1$ where N is the total number of time samples and $x(n)$ is the value of each time sample. The $(2\pi nk/N)$ term in the sin and cos function is a phase angle which rotates at the frequency of the desired filter. In essence we are mixing the desired input frequency

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(Ham Tech from page 4)

with a reference signal at the same frequency as the filter center to obtain a constant amplitude signal over the time samples. Then we add them together. This addition is integration and gives the process its S/N enhancement just like any other filter, analog or digital.

The FFT - As I said above the FFT only differs from the DFT in the order in which we do the calculations. One way to show the order in which the calculations are done is through a graphical depiction of all the complex multiplies, additions and subtractions. It is sort of a signal flow diagram. When drawn out it has the appearance of many butterflies on the paper. Thus the name butterfly has been adopted for the basic FFT computation stage. Figure 1 below is a depiction of the decimation in time FFT butterfly.

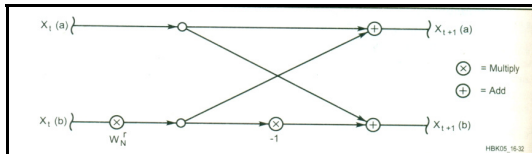


Figure 1 Decimation in Time FFT Butterfly

Note that the multiply in the center with -1 below it is a trivial process indicating that the adder to the right is actually doing a subtraction. The structure incorporates one complex multiply, a complex addition and a complex subtraction. This basic stage is used many times to form the FFT signal flow diagram. There is also a decimation in frequency FFT algorithm in which the multiply function follows the subtraction function. To see how the butterflies are connected to form an 8 filter FFT see Figure 2.

The input time samples arrive in serial fashion and must be aligned in parallel at the 8 input ports of the FFT. A shift register

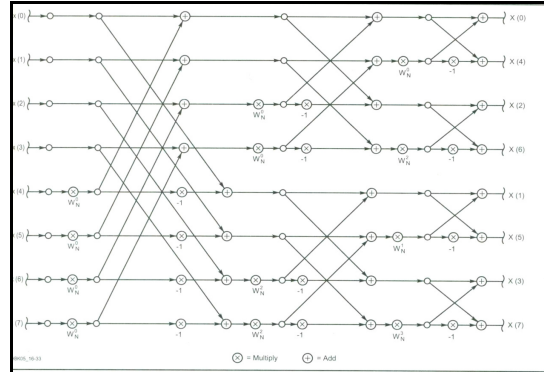


Figure 2, Eight Filter Decimation in Time FFT

type memory with taps on each stage can supply this function. The frequency bins on the output also arrive in parallel but are not in natural filter order. The order is known as address bit reversal and may be easily unscrambled to natural order if desired. This FFT structure is known as a block transform because all input signal samples must be available before the computations are started and all frequency bins are available at the same time. There are other FFT architectures like the sliding aperture which can operate with signals in a serial like form. The FFT can also provide transformations from the frequency to the time domain. It is then called an IFFT or inverse FFT.

What is the down side of the FFT filter bank? The most significant issue is the level of signal spill over from one filter to those adjacent to it. If our time domain aperture is rectangular, the usual case, the first frequency sidelobe is only 13.2 dB down from the signal filter peak. It decays according to a $\sin(x)/x$ function. We can add a weighting function ahead of the FFT, which can suppress the first side lobe to the - 43 dB level at

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Program That, Part 2

The Years 1952 and 1953

We continue to revisit those Fabulous Fifties being held captive by those equally Fabulous programs and speakers. That 'back room' is ice cold in winter and steaming hot in summer and really messy but like the lure of the Lorelei, I continue to be drawn into their mysterious depths that hold me captive. Just looking at and touching nearly century old documents brings them to life and I really feel that I know some of those great SJRAers whom I will never meet in this life.

1952

January: Propagation presented by I. E. Goldstein, Chief Engineer of the Antenna Development Section of RCA.

February: Crystals presented by SJRA's own Wally Brown, W2OQN.

May: The Vidicon Camera, about its uses and applications in industry presented by Jack Green of RCA.

June: A lecture and demonstration by Bob Gunderson, W2JIO, about some of the auditory test equipment used by blind hams and technicians.

July: What else but Field Day movies by Ed Kephart.

August: Jim Hall, K2AER, a well-known authority on SSB speaks and demonstrates SSB.

October: A demonstration with slides along with a talk on 'The Modulation Process in Color TV' presented by John Wentworth an RCA engineer working in TV.

Just a little interesting fact. Did you know that all RCA telephone numbers started with 722? Look on your phone and 722 equals RCA.

November: SJRA Field Day 1952, SJRA picnic 1952, a Five meter Xmeter hunt, and a

Special Events picture "It Can Happen Here."

1953

January: The Problem of Ignition Radiation by Howie Goffe, W2BGF. This is a must for all with a Mobil rig.

February: A talk, demonstration, and movies on recognition and disposal of certain types of bombs presented by Lt. G. P. Gorby of the 42nd E. O. D. Squad, Ft. Dix, NJ.

March: Scatter Sounding Techniques for Transmission Path Prediction presented by Mike Villard, W6QYT.

April: How to Read Weather Maps presented by Henry P. Adams, Meteorologist in charge of the Philadelphia Weather Bureau.

May: F. D. Waldhauer of the Circuit and Component Development Group of the Optic and Special Engineering Section of RCA's Engineering Products Division speaks on the Role of Transistors and their limitations as well as their possible future in Radio Communications.

June: Electronics in Geophysical Exploration for Oil presented by Kenneth Andrews of the Industrial Products Division of RCA.

July: A rip roaring discussion and gab fest on the pet gadgets, gimmicks, and what nots that go to make up the working of the average shack. Members can bring their 'electronic marvels' on a basement table and brag about them.

August: Transmitter hunt within the confines of the meeting hall, i.e., the Odd Fellows Hall in Haddonfield

October: I could not find out what the program was. It was 'a secret.' There were also movies of past transmitter hunts.

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President's Message

Ken – K2WB

Our White Elephant sale was very successful. Many thanks to all that have come out to help out the Donations. Auctioneers Roy, WB2EOD, and Ray, N3RG, did a great job finding new homes for the treasures that members donated to the club.

We are starting to form the SJRA 100th anniversary committee. Yes it is only 2 short years away, but I think it requires a lot of planning, fund raising to have a party that no-one will forget. If you are interested in helping please contact me.

Field Day will be here before we know it. Time to start thinking what you can do for the SJRA at field day, we are a team and it requires many talents to keep the SJRA No. 1 in the 6A category. Contact me and be part of the team! This is our only club event and *the SJRA needs your support*.

Ray, N3RG, has been getting a large number of membership renewals. We have 110 members and hopefully more to come. If you had not renewed your membership, now is the time, otherwise you will not be receiving Harmonics. Please send in your SJRA membership renewal as soon as you can. Act now so you don't get missed in the next roster. We have members on 3 continents. Emma san, JA9AA, Yokohara san, JM1VCY, and Alan, EI8EM. Not to mention the 90 that live in North American.

In closing, please support our nets and check in. It is a good way to meet other members of the club. Check in today.

Monthly Puzzle

Don – WA2DUE, wa2due at arrl dot net

Last months puzzles were:

What is the bandwidth of a series-resonant circuit with a Q of 50 at a frequency of 14 megahertz?

Solution: Bandwidth equals frequency divided by the unloaded Q, therefore $14/50 = 280$ kHz.

Several years ago at the clubs annual "White Elephant" sale, three radios were sold for a total of \$325. The second radio cost twice as much as the first and the third radio cost \$50 less than the second. What was the cost of each?

Solution: Given $R_1 + R_2 + R_3 = 325$ and $R_2 = 2R_1$ and $R_3 = R_2 - 50$. Solving for R_2 we have $R_2/2 + R_2 + (R_2 - 50) = 325$. Multiplying both sides by 2 we now have $R_2 + 2R_2 + 2R_2 - 100 = 650$. Combining like terms we obtain $5R_2 = 750$ and dividing both side by 5 we get $R_2 = 150$. And by substitution we get $R_1 = 75$ and $R_3 = 100$.

Matt, W2MAT, gave me his solution to the second problem. Thank you Matt.

For this month let us try these problems:

Three resistors are tied end to end forming a triangle. If all three have each the same value and an Ohmeter measures 100 Ohms across any one of them can you determine the value of these resistors?

The California gold rush occurred in 1849. How many "leap" years have transpired since then?

Please submit solutions and/or comments to wa2due at arrl dot net.

The Calls of the Wild

Many hams have several call signs and have been active throughout the four corners of our world. One member of the South Jersey Radio Association has a list of so many call signs, that I am sure he developed a hernia of the hand writing them all down for me. In addition, he advised me that he may have missed some. How does he remember what call sign he is using? This is truly amazing. Personally, I sometimes forget what call I am using in different contests and have to correct the 'oops.'

Here are some of the call signs that have been transmitted over the air by our own Jack, N2VW:

WN2BWO, WB2BWO, WA4SYG, WB2JJN, PJ2/WB2JJN (First DX call), VE3/WB2JJN, VE1/WB2JJN, N2VW, PJ2/N2VW, P4/N2VW, VP5/N2VW, KL7/N2VW, VE1/N2VW, VE2/N2VW, VE3/N2VW, P40T, VP5O, VP5N, VP5R, and VP5T.

The sagas behind these calls are more than just interesting. They are informative, historic, humorous beyond belief, and much more. If any of you attend one of our general membership meetings, ask Jack, N2VW, to tell you about some of his adventures with those calls - especially PJ2/WB2JJN. Jack has the ability to make you feel as if you are right at the scene of all the action.

Jack's XYL, Maria is also a ham. Her call is N2CIS and she holds a General license.

73 to All, Mary, KV2M

The SJRA would like to congratulate the following on their recent achievements:

Test session 02/12/14

Michael Weldon, KB2UMJ
10 Whitman Ave.
Stratford, NJ 08084
Upgraded to Extra

Mahlon Reeves, KB2MDM
804 E. Oak St.
Millville, NJ 08332
Upgraded to Technician

Blike Vandegrift
317 Hawkin Road
Southampton, NJ 08088
Earned his Technician

Mark Gipe, KD2DNN
521 Canterbury Ave.
Pitman, NJ 08071
Upgraded to General

Test session 03/12/2014

Joseph Lambariski, KD2JOE
143 Tuckerton Road
Shamong, NJ 08088
Upgraded to General

Leslie E. Veit, K3KPD
24 Buckingham Dr.
Southampton, NJ 08088
Upgraded to General

Troy K. Maiese
18 Hillard Way
Sewell, NJ. 08080
Earned his Technician

Enrique M. Saladin
244 Warren Dr.
Wrightstown, NJ 08562
Earned his Technician

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SJRA Jackets, Shirts, Hats

Order NOW - Next order going in soon!



Spring Jacket is \$44 (S,M,L,XL), Fall Jacket is \$55 (S,M,L,XL),
Shirts are \$27 (S,M,L,XL), Hats are \$25 (one size fits all)
Name and Call Sign embroidery included....Larger sizes slightly more!
Email Joe, KC2TN, with orders or additional info: *kc2tn at comcast dot net*

The SJRA sponsors *FREE* Amateur Radio FCC License testing on the second Wednesday of each month. The location is: 443 Commerce Lane, Suite 5, West Berlin, NJ 08091. Registration is at 7:00 PM and testing begins at 7:30PM. Walk-ins are accepted.

VE team members can be reached at VE@SJRA.org. A calendar and more information can be found on the SJRA web site.

March Meeting:**Fourth Wednesday****March 26, 2014**

The meeting commences promptly at 7:30PM in the first floor Meeting Room of the Gibson House on Main Street, Marlton, NJ 08053. Guests are always welcome.

Program For March:

Our March program will be presented by our own Ray Golley, N3RG. He will be talking about "How to roll your own Antenna." This will be interesting to hear how he created his tower too!

March 2014 Health and Welfare:

We say Happy Birthday this month to: 24 - Ira Weinstein, W2IRA; 24 - Chris Canatella, KC2GNQ; 27 - Albert Kaiser, W3LEQ; 28 - Howard Bates, KC2SNK; and 30 - Tony Canuso, N2ATB.

Kathy Edwards, KM2KME

First Class Mail

South Jersey Radio Association
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Haddonfield, NJ 08033

