

Emerging Tech Opportunities III

It sure is rewarding for me to see other individuals and small scale startups picking up on and successfully going with my previous emerging opportunities. All as small scale home-based Money Machines.

Several examples here include John Rees who offers a nice video on converting car alternators into power stepper motors. And Martin Carbone whose new desktop finishing products include a pair of very low cost scoring machines for boxmaking and bookbinding.

Or Frank Miller who has bunches of useful direct toner printed circuit products. Or Kevin Bennet with his easy to do "raised print" laser thermography. That uses nothing but a small desk lamp. Or Stan Griffiths and his fine new book on recycling Tektronix classic oscilloscopes.

Or Kirk McLoren who has his new *Micro Cogeneration* book that shows you how homemade power can actually end up cheaper than utility power.

Let's return to the scene of the crime. Here's what I see as the current crop of emerging opportunities. Along with several *Guru's Lair* filenames you could go to for more details. Stuff that suddenly has become cheap enough and real enough, yet remains fuzzy enough and undeveloped enough for superb potential...

Short Haul Telemetry

Micropower radio and infrared transmitters have gotten super small and quite cheap. To the point where they can be used for all sorts of data comm over ranges of, say, four to six feet. There are a lot of new possibilities here. I like to call the sum total of these devices *short haul telemetry*.

For instance, there are all kinds of new uses for ordinary TV remote controls. There are anti-shoplifting tags. And implanted animal monitors. And schemes to get data on or off a rotating shaft. Inventory controls. Security systems. Intelligent data tags. New wireless mice and modems. Car locks. 3-D position sensors. IRDA. Attitude detectors.

A brand new trade journal that addresses these devices is *Wireless Design and Development*.

One low cost and grossly underused short haul system is called an EKG heart monitor. This normally gets used to optimize aerobic exercise sessions. You have a strap that wraps around your chest. The strap picks up your electrical heartbeats and converts them into transmitted 36 cycle bursts of 5 kHz rf energy. These low frequency waves are then picked up by using a nearby wristwatch or bicycle mounted computer display. The big advantage is that they perform reliably during strenuous exercise. Cheap finger or

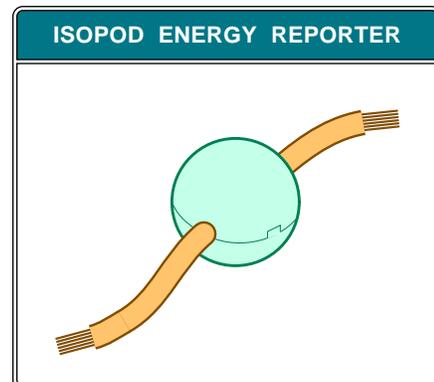
ear-clip infrared units do not. Look Ma, no wires.

All you really have here is an air core transformer. With the core being the distance between your chest and your wrist or handlebars. Plain old near field inductive coupling is all you require for effective comm.

But wait. What do we really have here? We have a tiny, lightweight, sealed and waterproof transmitter. With a one year or longer life from its internal lithium cell. Which can handle a data rate of zero to 200 Hertz or so. At a retail list price of \$22, far less in quantity. Providing a signal that is handily received by a coil and an op-amp or two. Largely unidirectional, except for deep axis nulls.

Two leading brands of these devices are *Polar* and *Vetta*. More details on their internal workings in [HACK68.PDF](#). By the way, a dental X-ray is a dandy way to reverse engineer sealed modules of this type.

One big new use I see for short haul telemetry...



The key to home energy awareness and conservation lies in easily measuring how much power you are using at any time. From there, you might intelligently optimize what power you use when. The big problem here has been that current sensors are very expensive, highly inconvenient and usually have to be electrician installed.

Note that most current sensors require that one (but not both) of the supply wires run through them.

Instead, the isopod simply snaps on your power lines as they enter your house. Inside the tennis-ball shaped device is a current transformer that both provides micro supply power plus a data rate proportional to current. The data gets safely transmitted to a nearby receiver.

Each isopod can either output an identifying code or else speak only when spoken to. Your transmitted data can be synchronized to the current zero crossings. Your receiving

unit can sort out which signals come from which sensors. The receiver can also measure the phase angle to separate real from reactive power. Actual power consumed can be found by multiplying the real component of the measured current against the supply voltage.

More on the isopod concept appears in [HACK47.PDF](#).

Non-linear Editing

I get lots of helpline calls for some way to "synchronize" two video signals. The synchronizer is easy enough, but the next thing you'll be asking for is a frame grabber. And a time base corrector. You will then demand switchers and chroma keyers. And a costly single frame write VCR. And SMPTE time code striping. And by that time, that [Video Toaster](#) from Newtek starts looking very attractive.

All of which ends you up with a room full of expensive gear. And you will *still* be stuck with awful final results because of the horrendous "generation loss" of most of the low-end video recording systems.

Instead, if you simply store each video field as digital data, you could completely eliminate *all of the above*. For digital video fields are inherently self-synchronizing, self-correcting, self-timing, self-switching and self keying.

With zero generation loss and no need for expensive gear for single frame recording. Even more important, digital video can be random accessed and combined in any order at any time. Using a plain old personal computer.

Which is what *non-linear editing* is all about. The ability to create a perfect generation-loss-free digital video master by gathering up what you want from where you stashed it. Layer after layer. Matte after matte. And do so ridiculously faster, cheaper, and infinitely more flexibly than any of the traditional and primitive *A-B roll editing* techniques.

The only little kicker is that you do need some random access storage to hold the video data. Quite a bit, in fact. Typical "broadcast quality" or 4-2-2 video takes around one byte per color pixel, so a single field is something around a quarter meg. Say fifteen megs per second and just under a gig per minute. Thus a half hour segment seems to need around thirty gigabytes of storage.

A year or two ago, such massive storage systems would have seemed absurd. But there's several new developments that make them routinely available. First and foremost, you can run out and cheaply buy a three Gigabyte hard disk. It doesn't take much in the way of smarts to use ten of these to make a thirty gig virtual drive.

Secondly, we now have data compression systems. Just using plain old LZW lossless data compression should buy you three to one or so in storage. The next step up is called DCT or JPEG compression. Which can often give you 30:1 squashing and still have acceptable quality for most users. The simplest and cheapest way to explore DCT is with the filters built into PostScript level II.

Both JPEG and its underlying DCT compression work on single images. For dramatic compression, you can go to MPEG techniques that are based on saving only motion-estimated changes between groups of successive fields.

Third, the MPEG and JPEG compression "standards" are exactly the same as a 1903 standard on aviation. These are already absurdly obsolete. Better solutions use wavelet technology from *Aware* or fractal techniques from *Iterated Systems*. More in [HACK60.PDF](#) and [HACK69.PDF](#).

The Digital Bogey

With one or two more memory iterations, we will soon have terabyte storage routinely and cheaply available. So, computers of human brain capability are virtually certain to show up in the next few years. Which can lead us to the *Digital Bogey*. The next step beyond nonlinear editing.

Given enough memory, there is no reason at all why *everything* in a movie cannot be an alterable data base. A cyberthespian's persona could get programmed at both the micro and macro levels. There would be no difference at all between actors, extras, props, vehicles, animation, and special effects. Each would end up as alterable numbers in a humongously large data base.

All of which means that an individual working at home will soon be able to produce an entertainment experience comparable to a first-run movie at a total cost of \$45 or so. Which will be a *one million to one* reduction of the costs of producing entertainment. Distribution, of course, would be via *Internet IV*. And on library teracubes, each of which will hold a decade's worth of movies.

All of which should profoundly affect the smog levels in the LA basin. *All types* of LA smog. No more grips or gaffers or foleys. Or any third assistant makeup supervisor safety director best boys.

Even more profound, we should be able to throw all of the original Bogey movies at the computer and then have it run off dozens of new ones. I can hardly wait.

There's bound to be a buck in here somewhere. More on the Digital Bogey in [HACK71.PDF](#).

FM RBDS Services

Commercial FM stations have a new *Radio Broadcast Data Service*. Described in an EIA/NAB standard. Intended uses are to identify their station, the singer and the song, traffic and weather, and emergency warnings.

But there are all sorts of emerging new uses involving differential GPS navigation correction info, custom paging, and tightly targeted coupon radio services.

The subcarrier is at 57 kHz and the baud rate is 1200 in any of several carefully specified formats. The SAA6579 from *Philips* is one low cost decoder chip.

More on RBDS is found in [HACK73.PDF](#).

Cheap Air Turbines

Dentists have rightly concerned themselves with AIDS and related viruses. As a result, many of them are going to single use throwaway tools. There is one new *disposable handpiece* from the *Oralsafe* folks that retails for \$14. This gem can be easily cut down into a miniature air turbine the size and mass of a plotter pen.

Actually, their turbine is nothing but a nylon pawl and two medium quality ball bearings. About fifty cents worth. Air turbines are usually high speed devices, well suited to drilling tiny printed circuit board holes.

The usual setup is to have a compressor, accumulator, and regulator in the 60 PSI "shop air" range. The needed parts are cheaply available surplus from *C & H Sales*. A restrictor valve is placed in series with the turbine to adjust your no-load pressure at the turbine to around half this. If you don't want to get into a real pneumatic system, a plain old truck tire should also work out just fine.

SOME MENTIONED RESOURCES

Aware, Inc.
One Memorial Drive
Cambridge, MA 02142
(617) 577-1700

Bennet LaserBrite
720 Fourth Street, SW
Rochester, MN 55902
(507) 280-9101

C & H Sales
PO Box 5356
Pasadena, CA 91117
(800) 325-9465

Martin Carbone
2519 Bath Street
Santa Barbara, CA 93105
(805) 682-0465

Stan Griffiths
18955 SW Blanton
Aloha, OR 97007
(503) 649-0837

Iterated Systems
5550A Peachtree Pky #650
Norcross, GA 30092
(404) 840-0310

Kirk McLoren
3309 1/2 Lynn Avenue
Billings, MT 59102
(406) 652-0018

Frank Miller
3535 Stillmeadow Lane
Lancaster, CA 93536
(805) 943-4746

OralSafe
43529 Ridge Park Drive
Temecula, CA 92590
(800) 237-8825

Parallax
3803 Atherton Rd, #102
Rocklin, CA 95621
(916) 624-8333

Polar
99 Seaview Blvd.
Port Washington, NY 11050
(516) 484-2400

John Rees
Rt 1, Box 1551
Sautee, GA 30571
(706) 865-5495

Vetta/Orleander USA
14553 Delano St #210
Van Nuys, CA 91411
(818) 780-8808

Wireless Design & Devel.
301 Gibraltar Drive
Morris Plains, NJ 07950
(201) 292-5100

On a CAD/CAM anything, the heavier the device you shove around, the worse the design problems. Sort of like pounds of extra satellite weight needing extra tons of fuel at the pad. So, the lighter and smaller the working head of your CAD/CAM system, the simpler the design.

Air turbines run extremely fast. For heavier work, some sort of a compact gear reduction head can give you slower speeds and more tail twisting.

One area where CAD/CAM offers exceptional untapped opportunities is jewelry making. A machine having a three inch range along each axis will do just fine. And is easily handled by low cost stepping motors. The usual route is to cut a machinable wax and then convert it into metal or whatever by a lost wax process. See [HACK76.PDF](#).

Sonoluminescence

Take a small tank of water and couple some fairly loud ultrasonic energy into it. Under certain circumstances, any tiny entrapped air bubbles may emit a clear blue light!

This effect is called *sonoluminescence*. At present, this is only a well researched laboratory curiosity, but it has some exciting potential. It appears the blue light comes from a heating of the entrapped air to temperatures of 10,000 and possibly as high as 50,000 degrees. What is happening is the bubble spherically concentrates energy at its center by twelve orders of magnitude. Yup, a million million.

The "blue" light is actually ultraviolet centered at 310 nanometers. Even more amazing, the light occurs in brief pulses a mere 50 picoseconds long.

What good is this stuff? Well, because of fundamental physical laws, a blue anything can end up very tricky to do. Sonoluminesce should also be a low cost source for the brief light pulses needed in laser spectroscopy.

The astonishingly high energy concentration might be adapted to solar energy collection. Possibly even scaled up to build a small plasma torch that might be used to safely vaporize hazardous materials.

Sonoluminescence temperatures and pressures also seem to get within shouting distance of nuclear fusion. Thus, the possibilities here are mind-boggling.

There are hundreds of current sonoluminescence papers. The simplest and quickest way to pick them up is with my web tools found at www.tinaja.com/webwb01.html. Or to make use of my custom *InfoPack* service. I have also posted a few key sonoluminescence papers to [HACK73.PDF](#).

Royalty-free Real PostScript

The general purpose PostScript computer language is rather adept at producing fine typography and smooth graceful curves. But real PostScript has not been available for typical projects like homebrew embroidery machines, sign routers, Santa Claus machines, CAD/CAM mills, pc drills, glass etchers, vinyl cutters, engravers, and such. At least not without having to pay outrageous royalties.

But no more.

There are now three effective routes which instantly let you apply PostScript to your homebrew projects.

The first is to use any old PostScript level II printer to do the tricky PostScript stuff for you. Teach the printer to use a *crossporting* technique where it writes motion codes to an unused serial or SCSI port. A simple brain-dead micro on your mechanical whatever then converts the motion codes to machine actions. The *Basic Stamp* from *Parallax* is ideal for this sort of thing and costs only \$39.

Second, there is some shareware called *GhostScript* that gives a fair to middlin' imitation of PostScript that runs on just about any host computer. GhostScript gets normally provided as a C-language source code, and in compiled versions for most popular host computers. Yes, GhostScript does provide screen previews.

Find Ghostscript links at www.tinaja.com/post01.html

But best of all is to use later versions of Adobe Acrobat as a general purpose and host based PostScript interpreter.

The trick here is to apply PostScript's *flattenpath* and *pathforall* operators to convert output into simple stroke vectors that you can recode and send to your homebrew machine. It is trivially easy to make all these commands HPGL or Gerber compatible.

Acrobat can easily write a disk file using any low level custom language you care to. Giving you full PostScript power in low level custom homebrew apps.

Full details in [POSTVECT.PS](#) and [RESBN19.PDF](#), while newer and more powerful solutions can be found on my [Flutterwumper](#) and the [Acrobat](#) and [PostScript](#) library pages at my <http://www.tinaja.com> ♦

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