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More sound source code (was Re: [stella] TIA Audio Polynomials)

Subject: More sound source code (was Re: [stella] TIA Audio Polynomials)
From: Adam Wozniak <adam@xxxxxxxxxxxxxxxx>
Date: Sat, 22 Nov 2003 09:22:38 -0800 (PST)

```
This fixes a pop in the output I hadn't noticed before.  It also will
handle mono or stereo buffers, so you could put channel 0 on the left and
channel 1 on the right if you wanted to, or mix them together.  (previous
code did one channel only)

#include <stdio.h>

// sound.c
// version 0.2
//
// Copyright (c) 2003 Adam Wozniak (adam@xxxxxxxxxxxxxxxx)
// All Rights Reserved
//
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// this copyright header remains intact.

// compressed polynomial tables...
static const int poly0[] = { // all ones
        1, -1 };
static const int poly1[] = { // 50% duty cycle
        1, 1, -1 };
static const int poly2[] = { // 16/31 duty cycle
        16, 15, -1 };
static const int poly4[] = { // 4 bit LFSR
        1, 2, 2, 1, 1, 1, 4, 3, -1 };
static const int poly5[] = { // 5 bit LFSR
        1, 2, 1, 1, 2, 2, 5, 4, 2, 1, 3, 1, 1, 1, 1, 4,
        -1 };
static const int poly9[] = { // 9 bit LFSR
        1, 4, 1, 3, 2, 4, 1, 2, 3, 2, 1, 1, 1, 1, 1, 1,
        2, 4, 2, 1, 4, 1, 1, 2, 2, 1, 3, 2, 1, 3, 1, 1,
        1, 4, 1, 1, 1, 1, 2, 1, 1, 2, 6, 1, 2, 2, 1, 2,
        1, 2, 1, 1, 2, 1, 6, 2, 1, 2, 2, 1, 1, 1, 1, 2,
        2, 2, 2, 7, 2, 3, 2, 2, 1, 1, 1, 3, 2, 1, 1, 2,
        1, 1, 7, 1, 1, 3, 1, 1, 2, 3, 3, 1, 1, 1, 2, 2,
        1, 1, 2, 2, 4, 3, 5, 1, 3, 1, 1, 5, 2, 1, 1, 1,
        2, 1, 2, 1, 3, 1, 2, 5, 1, 1, 2, 1, 1, 1, 5, 1,
        1, 1, 1, 1, 1, 1, 1, 6, 1, 1, 1, 2, 1, 1, 1, 1,
        4, 2, 1, 1, 3, 1, 3, 6, 3, 2, 3, 1, 1, 2, 1, 2,
        4, 1, 1, 1, 3, 1, 1, 1, 1, 3, 1, 2, 1, 4, 2, 2,
        3, 4, 1, 1, 4, 1, 2, 1, 2, 2, 2, 1, 1, 4, 3, 1,
        4, 4, 9, 5, 4, 1, 5, 3, 1, 1, 3, 2, 2, 2, 1, 5,
        1, 2, 1, 1, 1, 2, 3, 1, 2, 1, 1, 3, 4, 2, 5, 2,
        2, 1, 2, 3, 1, 1, 1, 1, 1, 2, 1, 3, 3, 3, 2, 1,
        2, 1, 1, 1, 1, 1, 3, 3, 1, 2, 2, 3, 1, 3, 1, 8,
        -1 };
static const int poly68[] = { // used by mode 15
        5, 6, 4, 5, 10, 5, 3, 7, 4, 10, 6, 3, 6, 4, 9, 6, -1 };
static const int poly465[] = { // used by mode 3
        2, 3, 2, 1, 4, 1, 6, 10, 2, 4, 2, 1, 1, 4, 5,
        9, 3, 3, 4, 1, 1, 1, 8, 5, 5, 5, 4, 1, 1, 1,
        8, 4, 2, 8, 3, 3, 1, 1, 7, 4, 2, 7, 5, 1, 3,
        1, 7, 4, 1, 4, 8, 2, 1, 3, 4, 7, 1, 3, 7, 3,
        2, 1, 6, 6, 2, 2, 4, 5, 3, 2, 6, 6, 1, 3, 3,
        2, 5, 3, 7, 3, 4, 3, 2, 2, 2, 5, 9, 3, 1, 5,
```

```
        3, 1, 2, 2, 11, 5, 1, 5, 3, 1, 1, 2, 12, 5, 1,
        2, 5, 2, 1, 1, 12, 6, 1, 2, 5, 1, 2, 1, 10, 6,
        3, 2, 2, 4, 1, 2, 6, 10, -1 };

static const int divisors[] = { // frequency dividers
        1, 1, 15, 1, 1, 1, 1, 1, 1, 1, 1, 1, 3, 3, 3, 1 };
static const int *polys[] = { // polynomial table
        poly0, poly4, poly4, poly465,
        poly1, poly1, poly2, poly5,
        poly9, poly5, poly2, poly0,
        poly1, poly1, poly2, poly68 };

struct state
{
        int offset, count, f;
        int rate;
        char last;
};

void TIASOUND_initstate(struct state *s)
{
        s->offset = 0;
        s->count = 0;
        s->last = 1;
        s->f = 0;
        s->rate = 0;
}

void TIASOUND_fill(int F, int V, int C,
                   int infrequency, int outfrequency, int channels,
                   char *buf, int size,
                   struct state *s)
{
        int value;

        while (size)
        {
                s->f++;
                if (s->f == divisors[C] * (F+1))
                {
                        const int *poly = polys[C];
                        s->f = 0;

                        s->count++;
                        if (s->count == poly[s->offset])
                        {
                                s->offset++;
                                s->count = 0;
                                if (poly[s->offset] == -1)
                                {
                                        s->offset = 0;
                                }
                        }
                        s->last = ! (s->offset & 0x01);
                }

                s->rate += outfrequency;

                while (s->rate >= infrequency && size)
                {
                        *buf += s->last ? (V << 3): 0;
                        s->rate -= infrequency;

                        buf += channels;
                        size -= channels;
                }
        }
}
```

```
void main(int argc, char **argv)
{
        char buf[44100];
        struct state s;
        int i;

        // be sure to reset s whenever C, F, or V change
        TIASOUND_initstate(&s);

        // usage
        if (argc != 4)
        {
                fprintf(stderr, "Usage: %s <F:0-31> <V:0-15> <C:0-15>\n", argv[0]);
                exit(-1);
        }

        // clear the buffer
        bzero(buf, sizeof(buf));

        // fill the buffer
        TIASOUND_fill(atoi(argv[1]),
                      atoi(argv[2]),
                      atoi(argv[3]),
                      31456, 44100, 1,
                      buf, sizeof(buf), &s);

        // write it to stdout
        write(1, buf, sizeof(buf));
}

--
adam@xxxxxxxxxxxxxxx        http://cuddlepuddle.org/~adam/pgp.html
Will code for food.         http://cuddlepuddle.org/~adam/resume.html
"The dinosaurs are not around today because they did not have a space program."
  -- Arthur C. Clarke
```


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  - **Eckhard Stolberg** - Sat, 22 Nov 2003 16:35:42 -0500 (EST)
  - **Adam Wozniak** - Sat, 22 Nov 2003 17:30:58 -0500 (EST)
- **Adam Wozniak** - Fri, 21 Nov 2003 18:04:10 -0500 (EST)
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