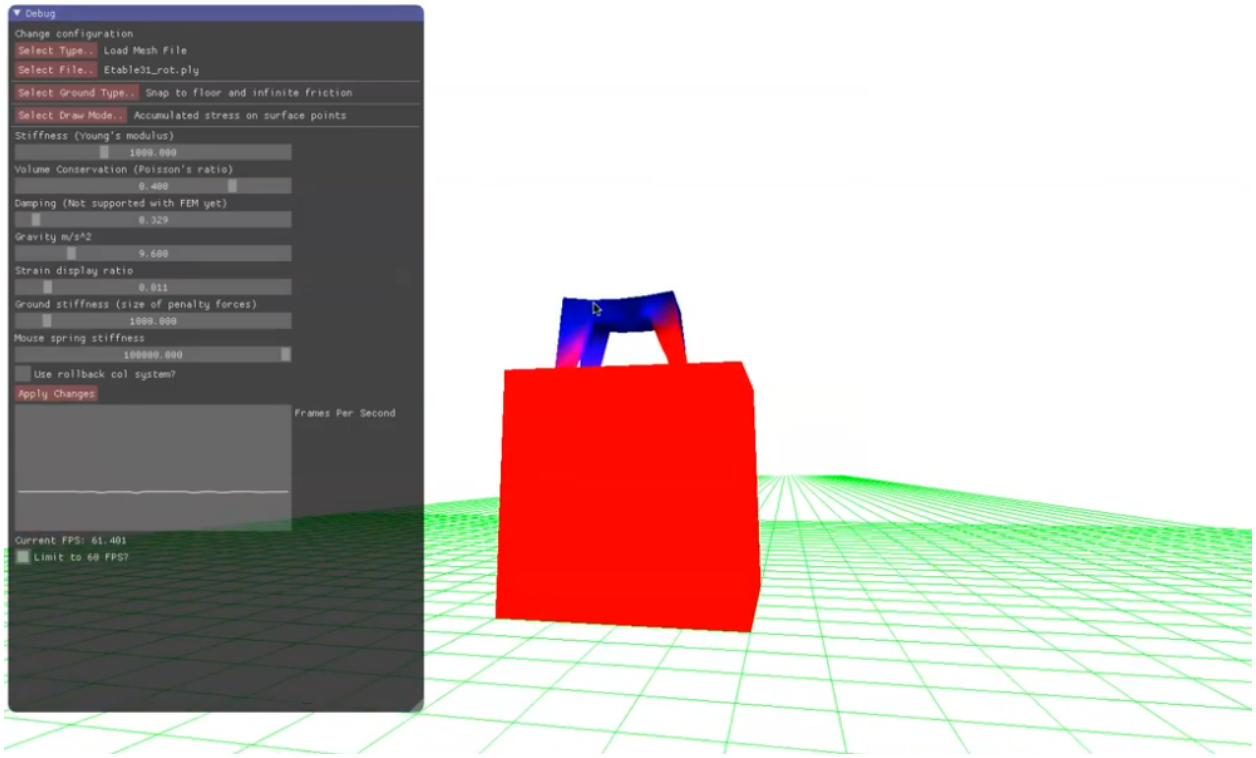
Physics

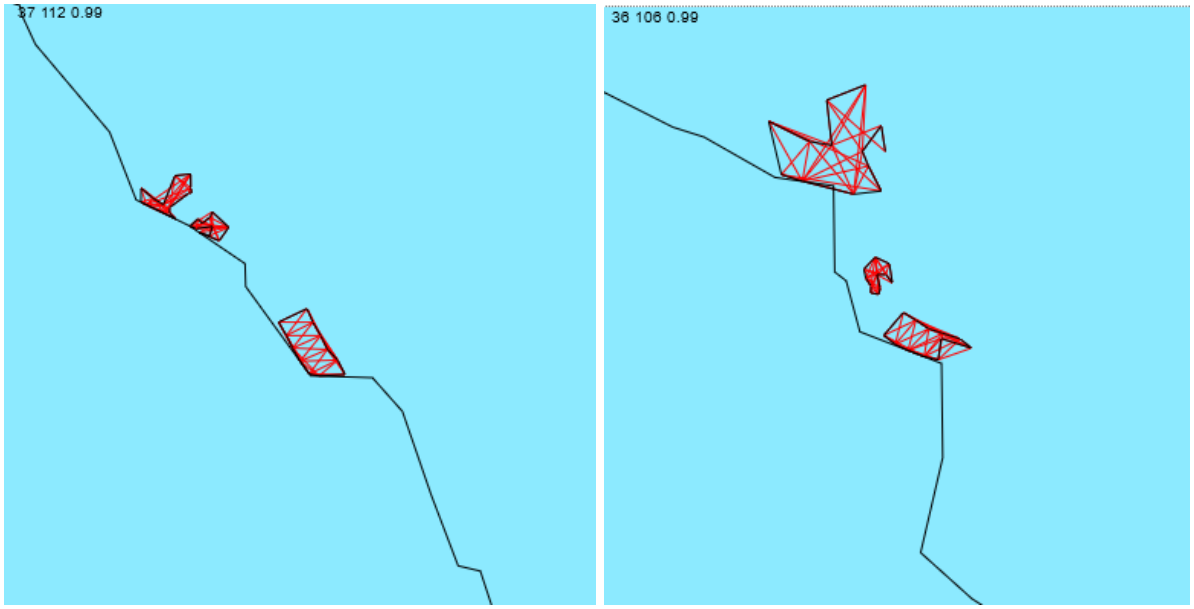
Bachelor Thesis - Simulating Deformable Solids with Co-Rotational FEM - 2015



Simulated deformable solids in real time with C++, OpenGL and the Eigen linear algebra library. Based on Matthias Müller course notes with extra derivations for fixed points while compensating for rotation.

Video: https://www.youtube.com/watch?v=w-yNQuEIRaM
Paper: https://digitalcommons.calpoly.edu/cscsp/99/
Code: https://github.com/patrickriordan/mass-spring

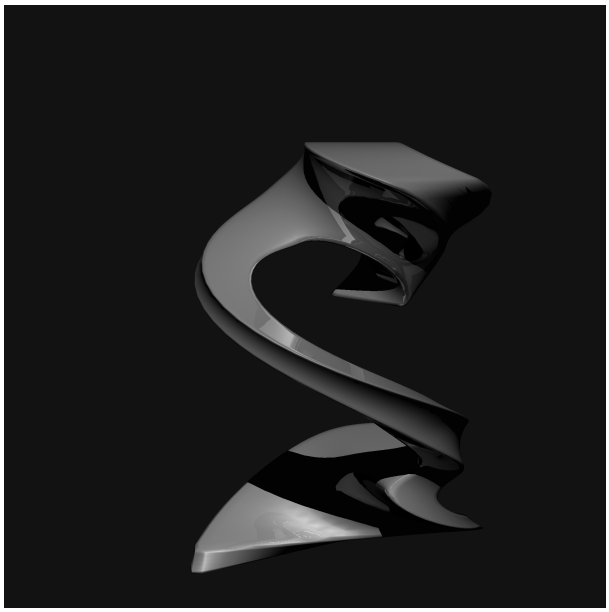
Duck Race - 2D Mass-Spring Physics playground - 2012

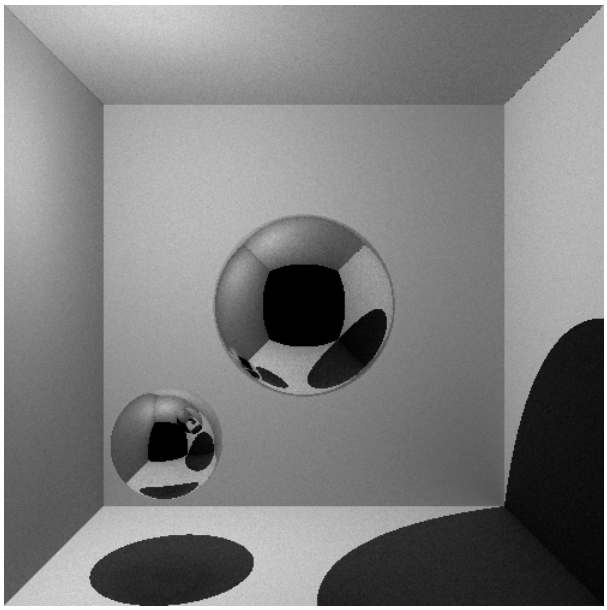


Simulated mass spring systems falling down an infinite mountain in javascript with some fun chicken shaped blobs.
Play: https://patrickscottriordan.com/Dope8.html

Vector Math

Ray Tracer - 2013

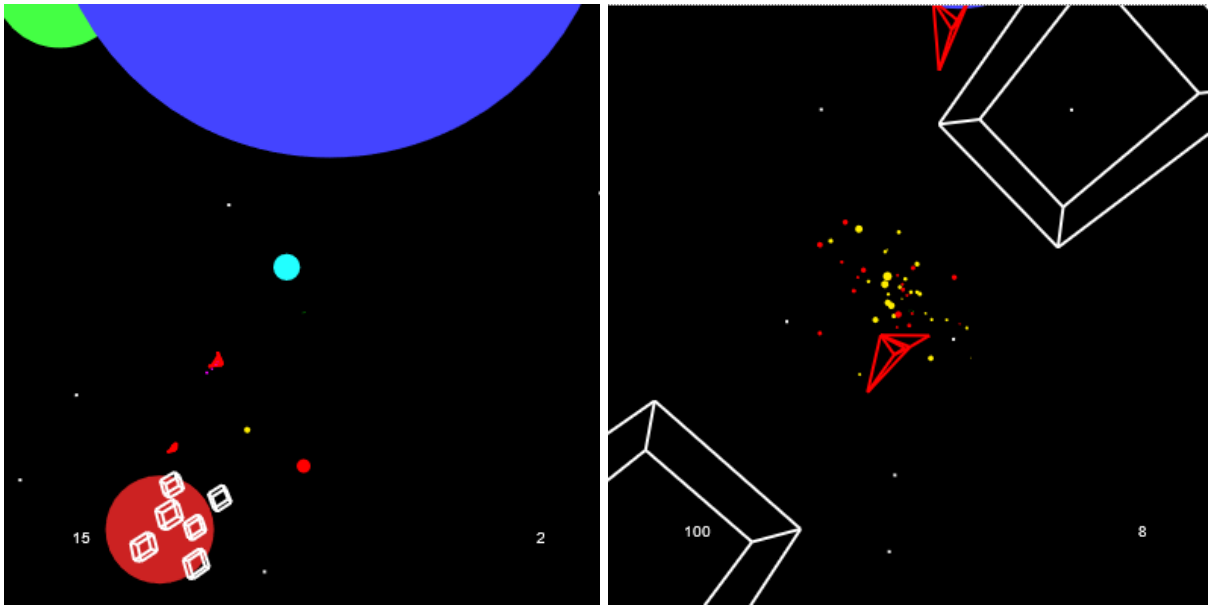




I made an offline black and white ray tracer in C with global illumination (Path Tracing). Also it has its own .OBJ file parser.

More renders:
https://patrickscottriordan.com/raytracerimages/roompathtest.png
https://patrickscottriordan.com/raytracerimages/roomray.png
https://patrickscottriordan.com/raytracerimages/teapot.png
https://patrickscottriordan.com/raytracerimages/teapottracetestsepcularhiglists2.png

From the Red Planet - 3D vector graphics game - 2011



Implemented perspective transformation with homogeneous coordinates from scratch in javascript to make a cute first person space game.

Play: https://patrickscottriordan.com/pow0_4.html

Game Networking

NAT Hole Punch through with UDP - 2013

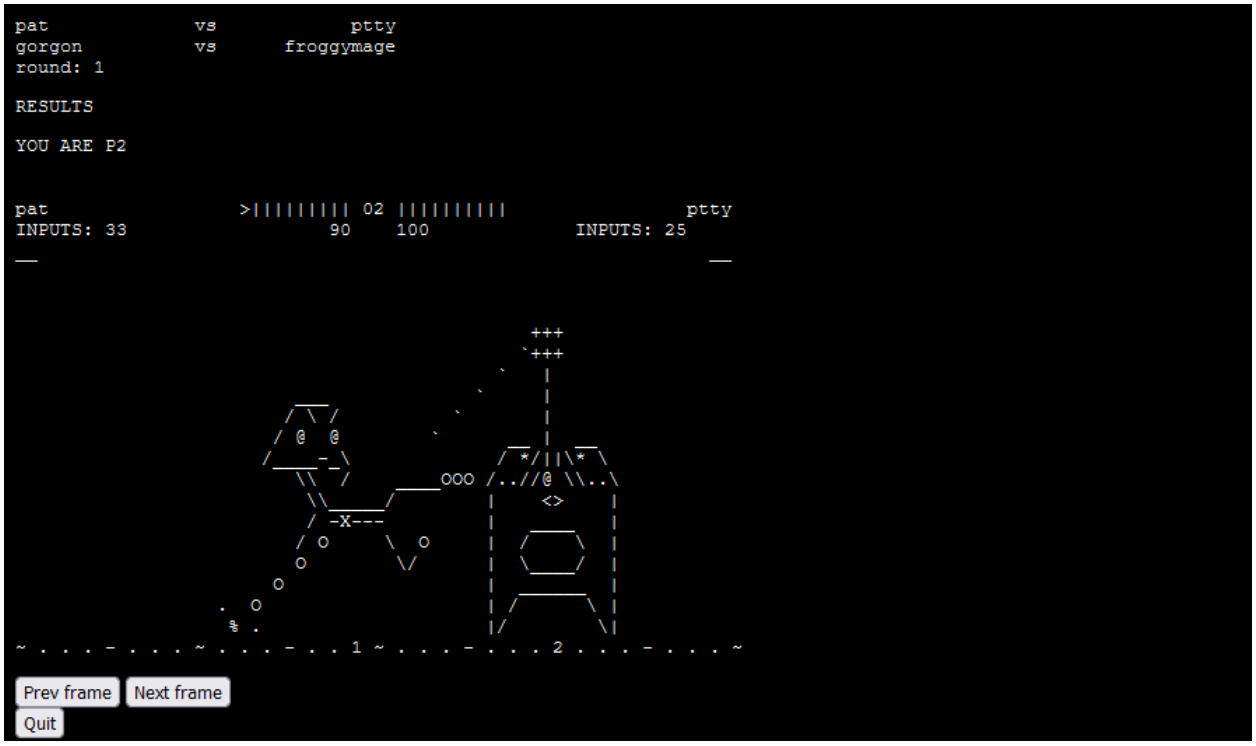
```
    if(poll(&fds,1,1000)==0)
    {
      buffer[0] = 0;
      buffer[1] = 1;
      sendto(sockfd,buffer,2,0,res->ai_addr,res->ai_addrlen);
      printf("Resending server hostlist request\n");
      prevtime = time(NULL);
    }
  }
  if(state ==1) {
    if(poll(&fds,1,1000) ==0) {
      printf("Resending server become host request\n");
      buffer[0] = 0;
      buffer[1] = 0;
      sendto(sockfd,buffer,2,0,res->ai_addr,res->ai_addrlen);
    }
  }
  if (state == 2) {
    if(poll(&fds,1,1000) ==0) {
      printf("Resending server connect to host request\n");
      buffer[0] = chost + 1;
      buffer[1] = 0;
      sendto(sockfd,buffer,2,0,res->ai_addr,res->ai_addrlen);
    }
  }
  if (state == 3) {
    if(poll(&fds,1,20000) ==0) {
      printf("Sending server ping\n");
      buffer[0] = chost + 1;
      buffer[1] = 1;
      sendto(sockfd,buffer,2,0,res->ai_addr,res->ai_addrlen);
    }
  }
  if (state == 4) {
    if(poll(&fds,1,100) ==0) {
      printf("Resending connection ack\n");
      sendto(sockfd,"0",1,0,(struct sockaddr*)&otherclient,otherlen);
      prevtime = time(NULL);
    }
  }
  if (state == 5) {
    if(poll(&fds,1,500) ==0) {
      printf("Resending connection ack\n");
```

It's not the cleanest of code but getting peer to peer connections working over NAT was one of my proudest programming achievements. When I was in highschool I got a big slap in the face when my first networked game didn't work because of this thing called "NAT".

StratGame - Peer-to-Peer lockstep networking - 2019

Used PJSIP's ICE (udp hole punch through) to create a ASCII starcraft clone. It's a real time peer-to-peer multiplayer game in C using deterministic lockstep.

ASCII Strikers - Online turn based fighting game - 2020

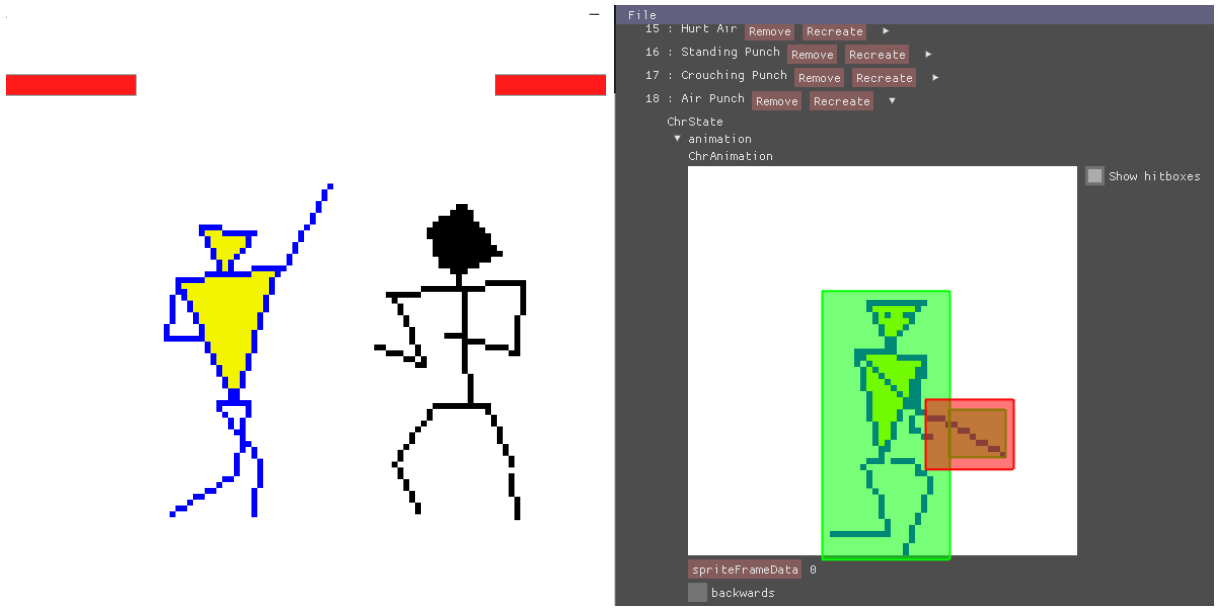


Authoritative server written in C + frontend in javascript. Simple matchmaking with turn based combat.

Play: https://patrickscottriordan.com/punchpalsofflinewww/

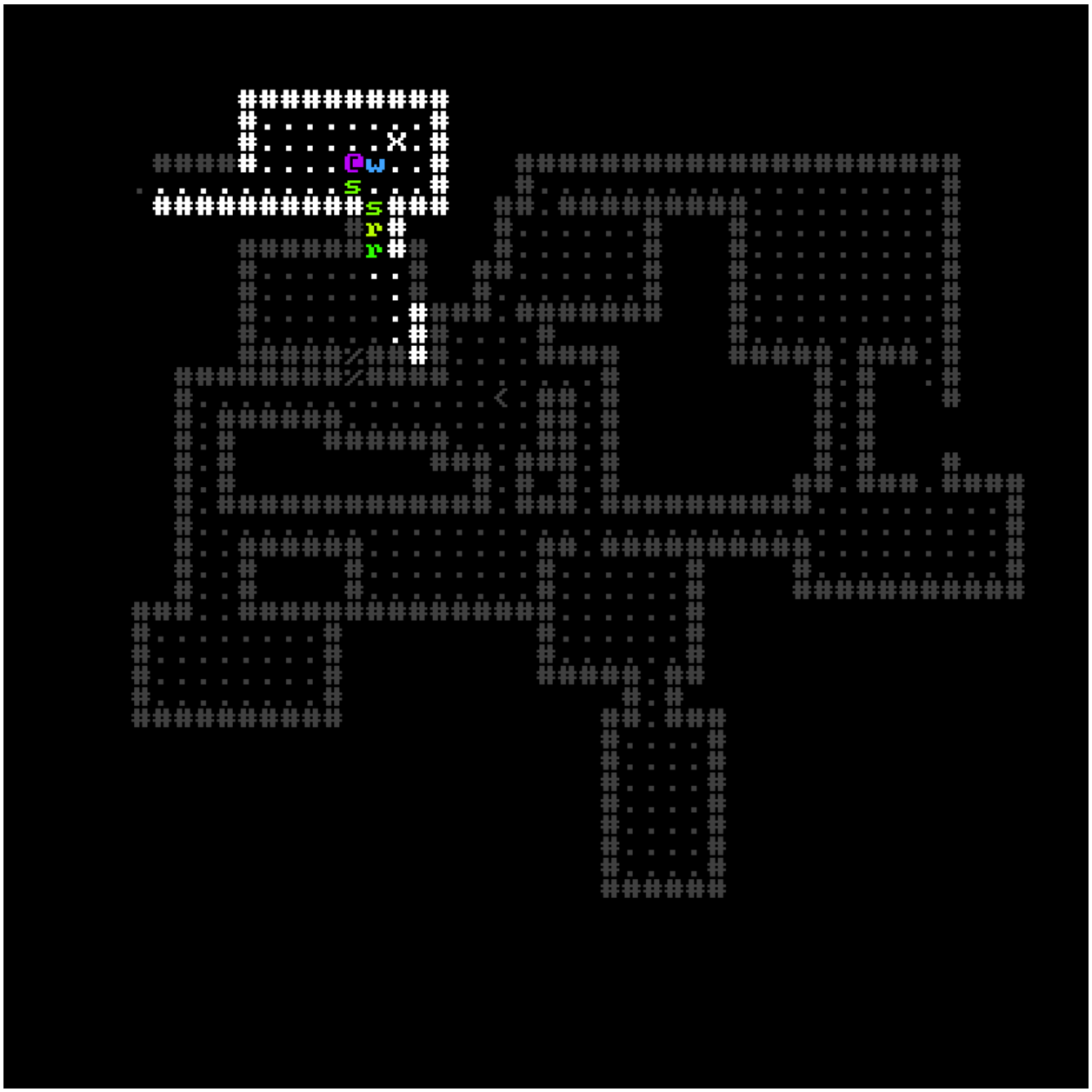
C++ Games

Custom Punch Pals - 2D fighting game with character editor - 2014 through 2019



I tried to make a 2D fighting game with great character creation support akin to MUGEN. I got it to the point of a basic 2D fighting game with an extremely flexible character editor although not easy to use. This is a custom engine written in C++ and OpenGL with over 10k lines of code and an embedded lua interpreter for editor plugins.

My Cousin the Rogue - Traditional Roguelike - 2020-Current



A traditional roguelike written in C++ using libtcod. Releasing on steam in Q1 2022!

Steam page: https://store.steampowered.com/app/1603590/My_Cousin_the_Rogue/