Software Projects

The following slides outline ideas for software projects. You are very welcome to discuss your own project ideas with any of the presenters at any time, either by e-mail or in person.

Once you have formed a group of (ideally) 3 or 4 people and are interested in one of the topics, just e-mail me and I can reserve that topic for you.

If another group is interested in the same topic, the client might come up with a related project instead.

If you have a group but are not interested in any of the suggested topics, just contact me and we will think about something else for you.
Software Project Proposals

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Polling platform

One interesting aspect of election season are the polls that are used to gauge voter sentiment. Polling/survey systems that allow for effective data collection and subsequent analysis have applications ranging from humanitarian efforts to customer satisfaction.

Your task is to build an end-to-end polling system. The system should support use cases like:

The ability to design a survey that includes questions with various response types (text, multiple choice, etc.) and show/hide logic for certain questions.

The ability to assign a survey to a collector for data gathering.

The ability to analyze and visualize the results of the survey.
Guided tour application

Your friends are coming to town! You finally get the chance to show them around your city. Except, inevitably, for one day during the visit you have to go to work (or school) and leave your friends to fend for themselves.

Your task is to build a web application that allows you to share a personalized guided tour of a city with other people. The application should provide things like:

The ability to annotate a map with a sequence of personal recommendations (locations tagged with notes, a suggested amount of time to spend, etc).

The ability to share trips privately with another person.

Integration with transport APIs (e.g. public transit, Uber) and local business APIs (e.g. Foursquare), to help get around and find bargains.
VR game

Write a VR game for Google cardboard. Anything at all! Dream it, design it, implement it, extend it.

This is a great place to start.
Project Suggestions

Nam Chu Hoai
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Background

- My name is Nam Chu Hoai.

- I work for a company near South Station called Wellframe. We are a healthcare software company. I do web development for them.
Big Data Processing

• The advent of cloud computing as well as ever-falling cost of computing in general allows us to process more data and derive more insights from it than ever.
  
  Modern tooling like Hadoop/Spark allows small teams to provide interesting applications on top of the wealth of data.
  
  Important to have a lot of interesting data.
Example Project

• There is lots of data out there! Find data that interests you! This is just to spark some ideas.

• **Health Plan Performance Data**
  • Allow users to explore/filter/search/visualize the data on a Webpage
  • Backend does the heavy lifting either via a plain relational SQL database or something like Spark

• **FDA Drug Database**
  • Allow users to input symptoms and side-effects and determine which drugs commonly cause them
  • Given a drug find similar drugs with similar side-effects
Realtime Web

- Elixir is a very interesting language on top of the Erlang. Erlang is one of the most scalable languages that powers virtually telecommunications networks.

- It’s particularly great at realtime scenarios
Example Project

• Realtime Chat
  • Basically build WhatsApp (who famously sold to Facebook for $19 Billion with only 50 engineers) / or Snapchat

• Polling Application via text
  • You can use services like Twilio to provide a realtime polling application that shows results in realtime

• Build Uber
  • Realtime monitoring of devices as they move in space/time
  • Intelligent Dispatch

• Patient Reminder application
  • Like Wellframe, provide medication and other reminders for users to stay on top of their health
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www.ristcall.com
www.alertcall.org
Cloud based dashboard

Patient device

Staff device
RistCall V3.0  (2015)

1) No speaker
2) No MicroPhone
3) No GPS
4) No Cellular
5) No extra sensors
6) No Camera
RistCall V2.0 (2014)
RistCall (Proof of concept - 2013)
Proposed projects

• Whatsapp Voice communication using TCP
• Whatsapp Image sharing using UDP
• Whatsapp text communication using HTTP
• Fall detection with accelerometer and notification to mobile client

Project requirements
1) C/C++ language
2) Embedded system
   1) CC3200 Launch pad
   2) Amazon web server
Marc Pomplun’s Suggestions:

Project 1: A 3D Tennis Game

- Use OpenGL to show 3D tennis court and players (can be very simple design)
- User controls movement of player and time to start swinging the racket.
- Actual tennis rules (best of 1, 3, or 5 sets).
- Camera location is variable.
- Bonus option: Computer player.
Project 2: A 3D Cellular Automata Simulator

• In a 3D array of square cells, the state (0 or 1) of a cell in the next iteration depends on the current states of its neighboring cells and itself.

• 2D Example: The Game of Life
  If an occupied cell has 0, 1, 4, 5, 6, 7, or 8 occupied neighbors, it dies. If an occupied cell has two or three neighbors, the organism survives. If an unoccupied cell has three occupied neighbors, it becomes occupied.

• In your simulation, the user enters the system’s size, the initial cell states, and the state update function.

• The program visualizes the iterations of the system and detects cycles, i.e., recurring system states.
Project 3: Genetic Programming

- Genetic programming is a method that simulates evolutionary processes to generate programs for solving a specific problem.
- An initial set of random programs competes against each other.
- The winners will generate “offspring,” including mutation and crossover, to form the next generation.
- This way, the performance of programs tends to improve from generation to generation.
- Problem suggestion: Variant of the “Pong” game.
Project 4: Object Tracking in Video Sequences

• Application can load any video file of certain type.
• While video is playing, user can select rectangular area within an object.
• Selected area moves with the object wherever it goes.
• Using local features such as color histograms and intensity gradients for tracking.
• Program outputs length of object path, maximum speed etc. for each tracked object.