



BananaMark

THE FINAL FRONTIER



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BACKGROUND

- **Project Description**
 - Native Development
 - Power
 - Novel Techniques
- **Goals**
 - We benchmark the Android
- **Testing Platforms**
 - Emulators and Physical Devices

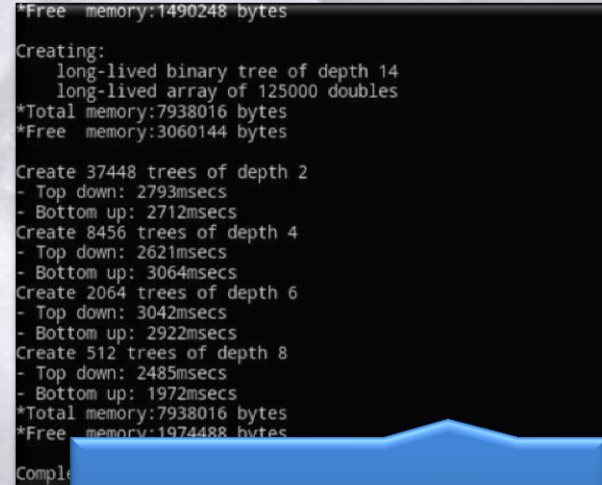




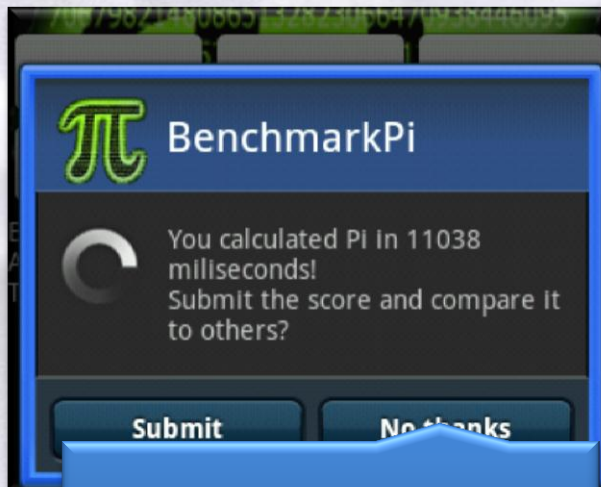
RESEARCH



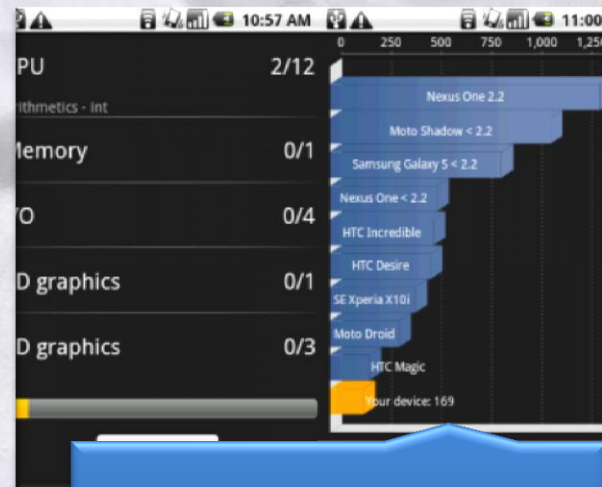
Antutu



OxBenchmark



BenchmarkPi



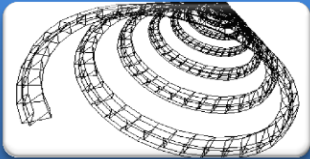
Quadrant



BRAINSTORM



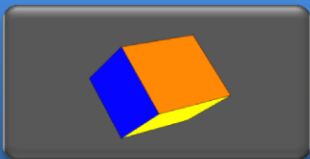
Fractals



Matrix Generation



2D Graphics



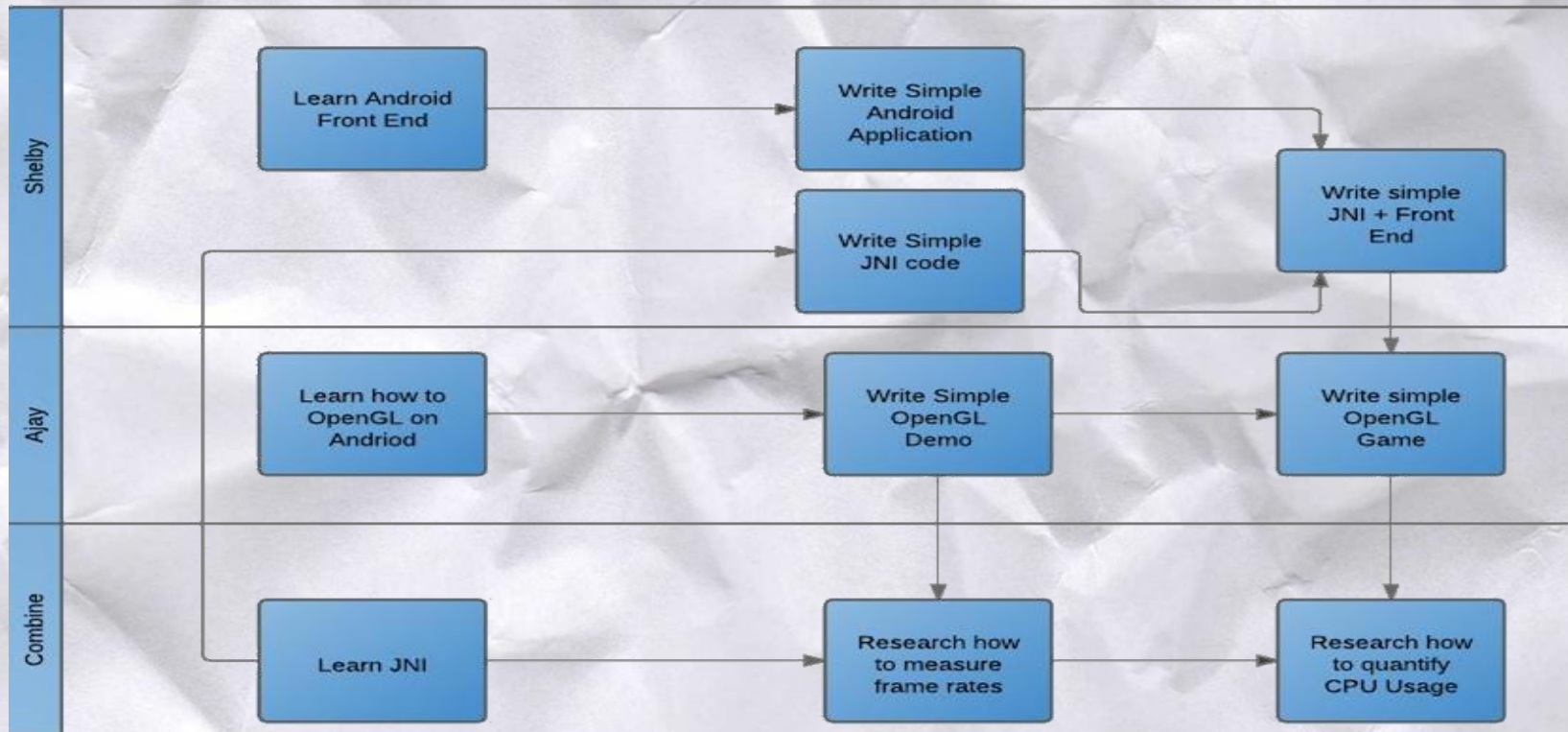
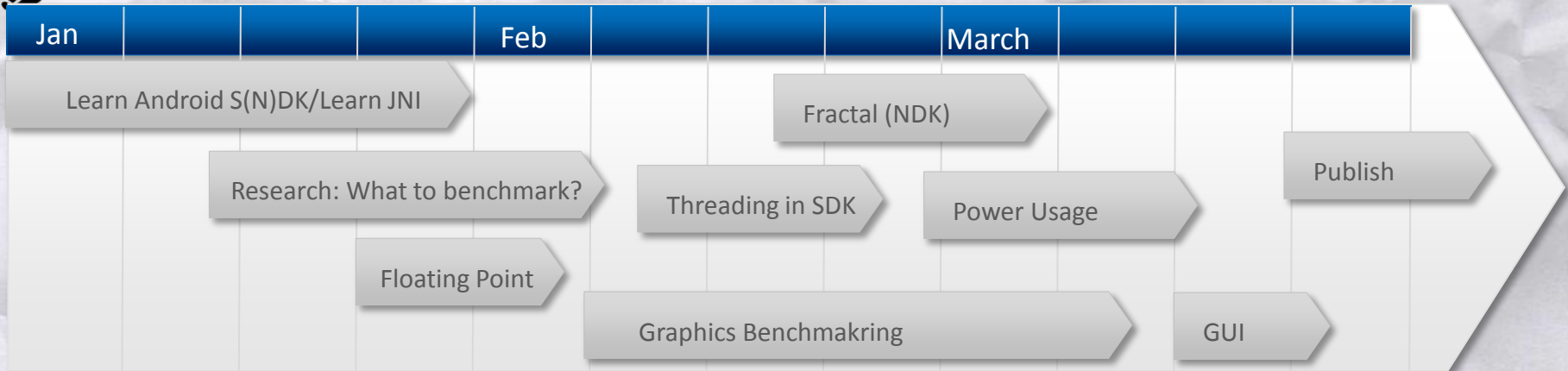
3D Graphics



PowerUsageSummary

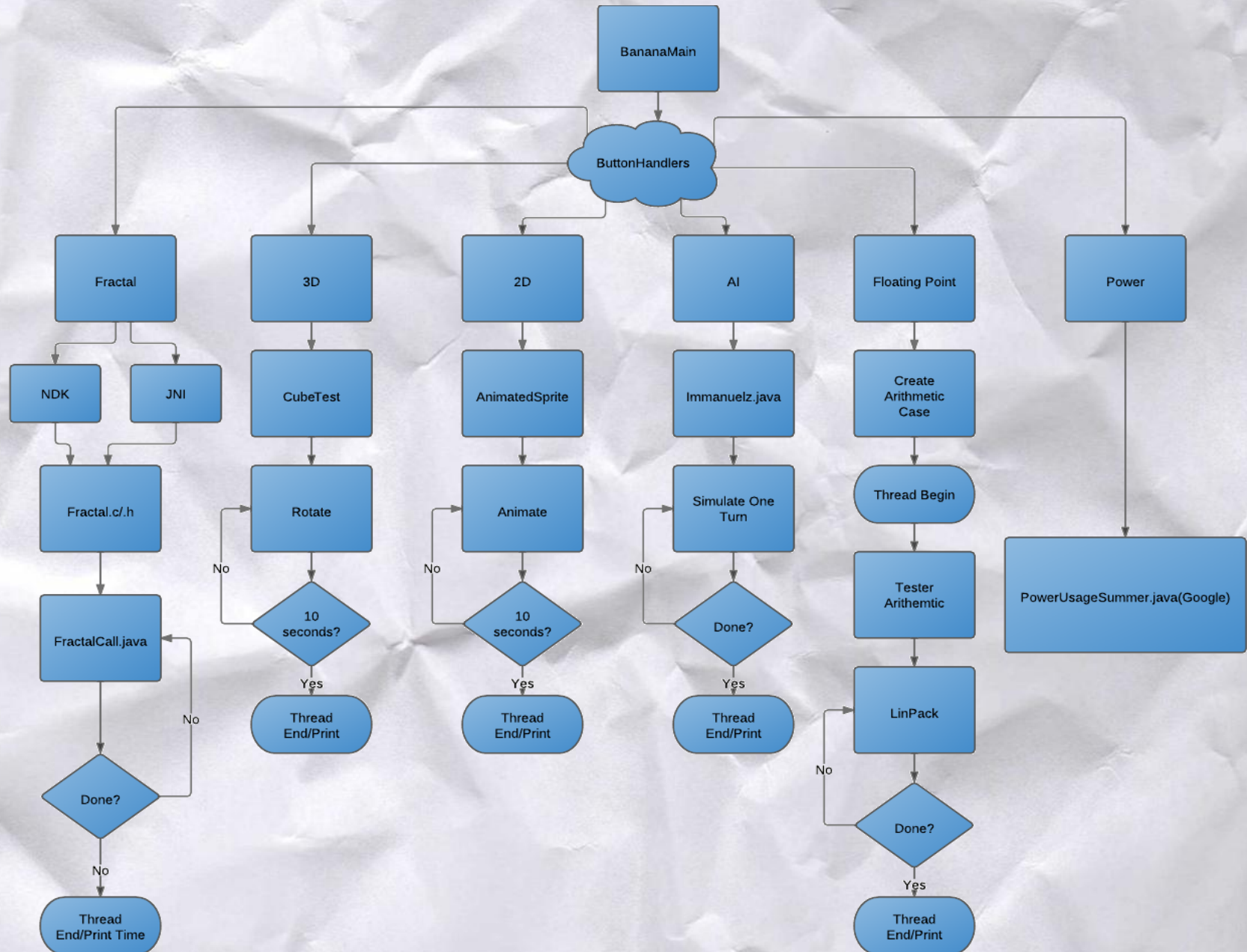


TIMELINE





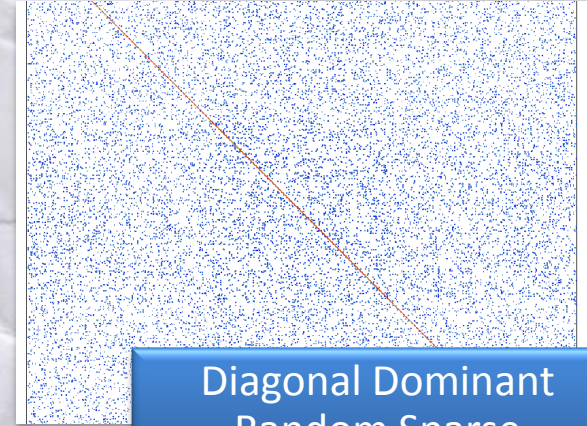
PROJECT FLOW





FLOATING POINT

- **What is Linpack?**
- **What is the credibility?**
- **What benchmarks were used?**
 - **Matgen**
 - **Epsilon**
- **How is it used?**

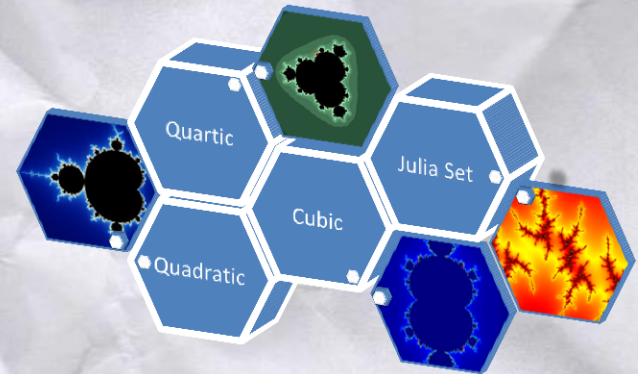


Diagonal Dominant
Random Sparse



NDK

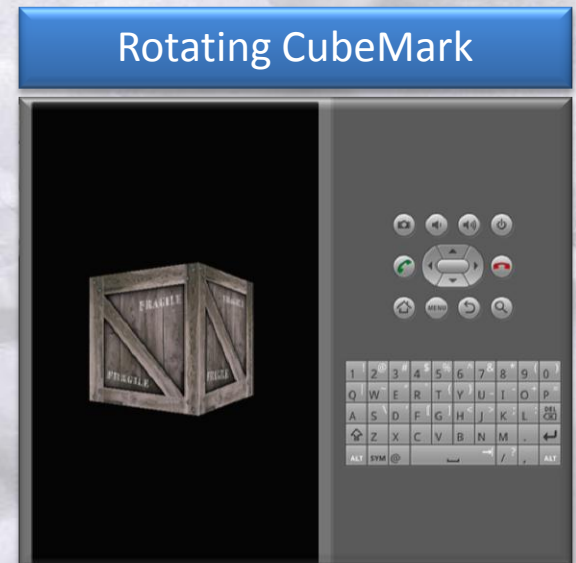
- **Why Fractals?**
- **Mandelbrot set**
 - { **Algorithm** } = $\mathbf{Z(n)^2 + C}$
- **Source (Bryne)**





GRAPHICS - OPENGL ES

- **What is it and why should we care?**
- **Components benchmarked:**
 - Empty Surface Area
 - Textured Cube with rotation
 - Shader integration
 - Results





GRAPHICS - PROCESSING

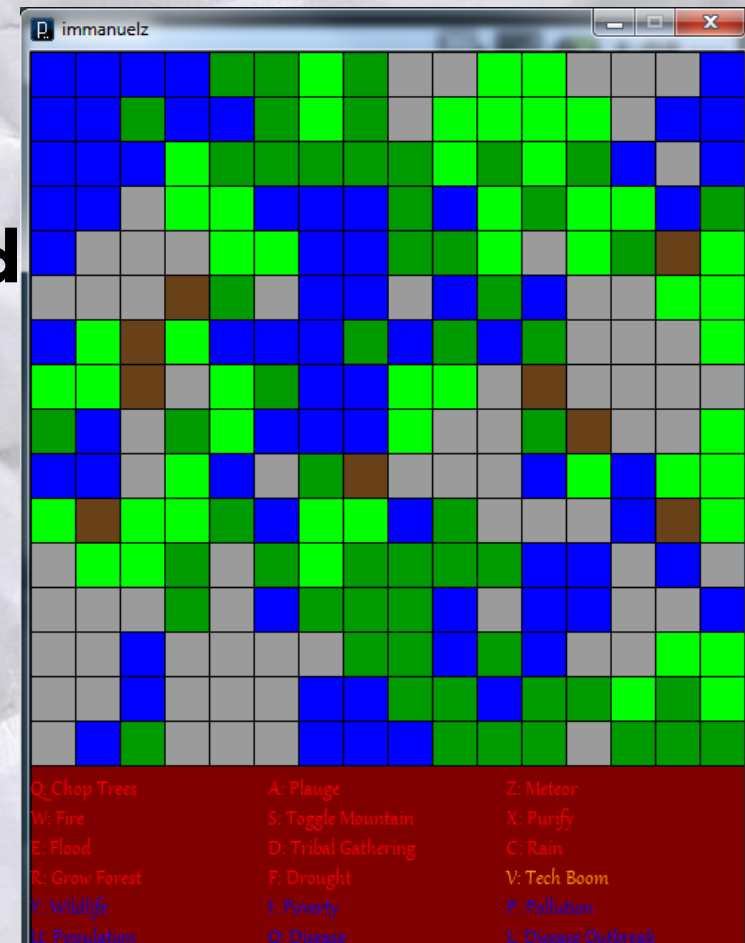
- **What is it and why should we care?**
- **Components benchmarked:**
 - **Basic animated sprite**
 - **Recursively-constructed fractal tree**
 - **Results (so far)**





ARTIFICIAL INTELLIGENCE

- What are these and why should we care?
- Components benchmarked:
 - Immanuelz (a Goal-Oriented Behavior simulation)
 - Results (so far)





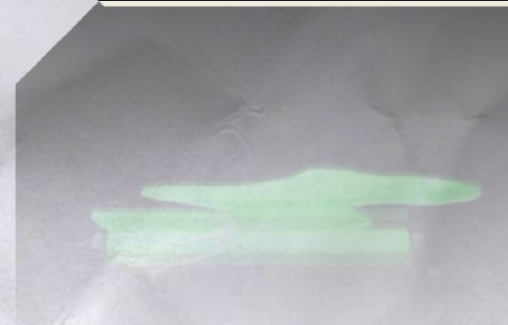
POWER

- How to benchmark power?

- Papers:

An Analysis of Power Consumption in a Smartphone – Aaron Carroll, NICTA and University of New South Wales

- Why is it difficult?





IMPROVEMENTS/CHALLENGES

- **Power Benchmarks**
- **Pushing phones harder**
- **Networking scores**
- **What is CPU usage?**
- **Threads**
- **Emulator Limitations**





CONCLUSION

- The difficulty with cross library benchmarks
- Importance of overhead
- Is the NDK really necessary?
- How conclusive *are* these benchmarks?

