

Fourth Laboratory Assignment – ZIP Code to State Code Lookup

CS130 (Section 15046)

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OVERVIEW

This assignment implements an ARMv7 (Cortex-A9) function:

- `findZips` – receives a 5-digit ZIP code in R0 and returns the corresponding FIPS state code in R0 (or 0 if invalid, out-of-range, or not found).

Execution was performed on CPULator (DE1-SoC): <https://cpulator.01xz.net/?sys=arm-de1soc>. Results were read directly from register R0.

TEST PLAN & EXPECTED RESULTS

| Input ZIP | Rationale | Expected R0 |
|-----------|-------------------------------------|----------------|
| 90210 | Valid ZIP (Beverly Hills) | 6 (California) |
| -5 | Negative number | 0 |
| 0 | Zero | 0 |
| 333 | In-range but not in any table entry | 0 |
| 100000 | Greater than 99999 | 0 |
| 91371 | Pierce College (assignment example) | 6 (California) |
| 55552 | Minnesota example | 27 (Minnesota) |

TEST RESULTS

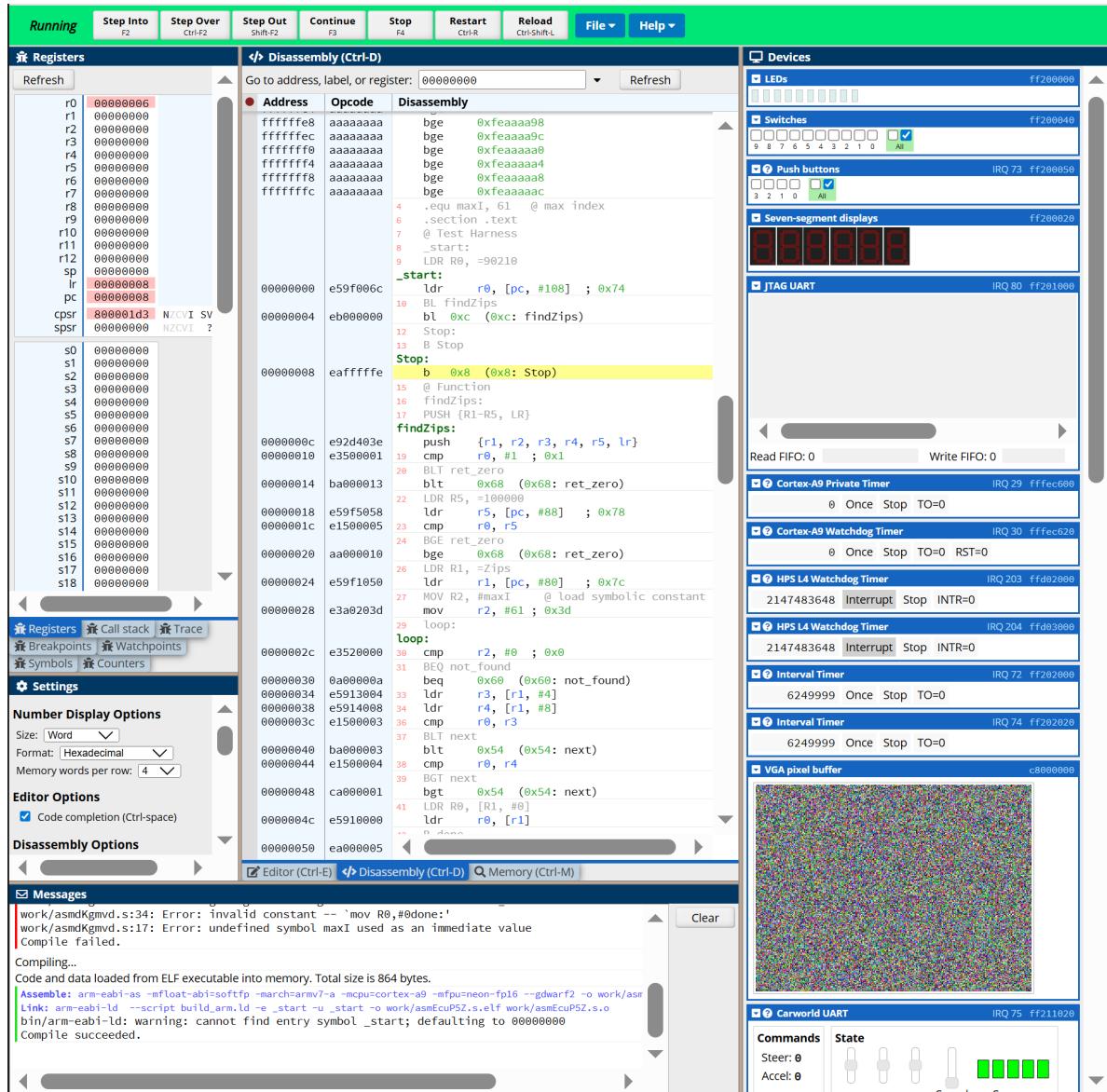


Figure 1: Valid ZIP 90210 → R0 = 6 (California)

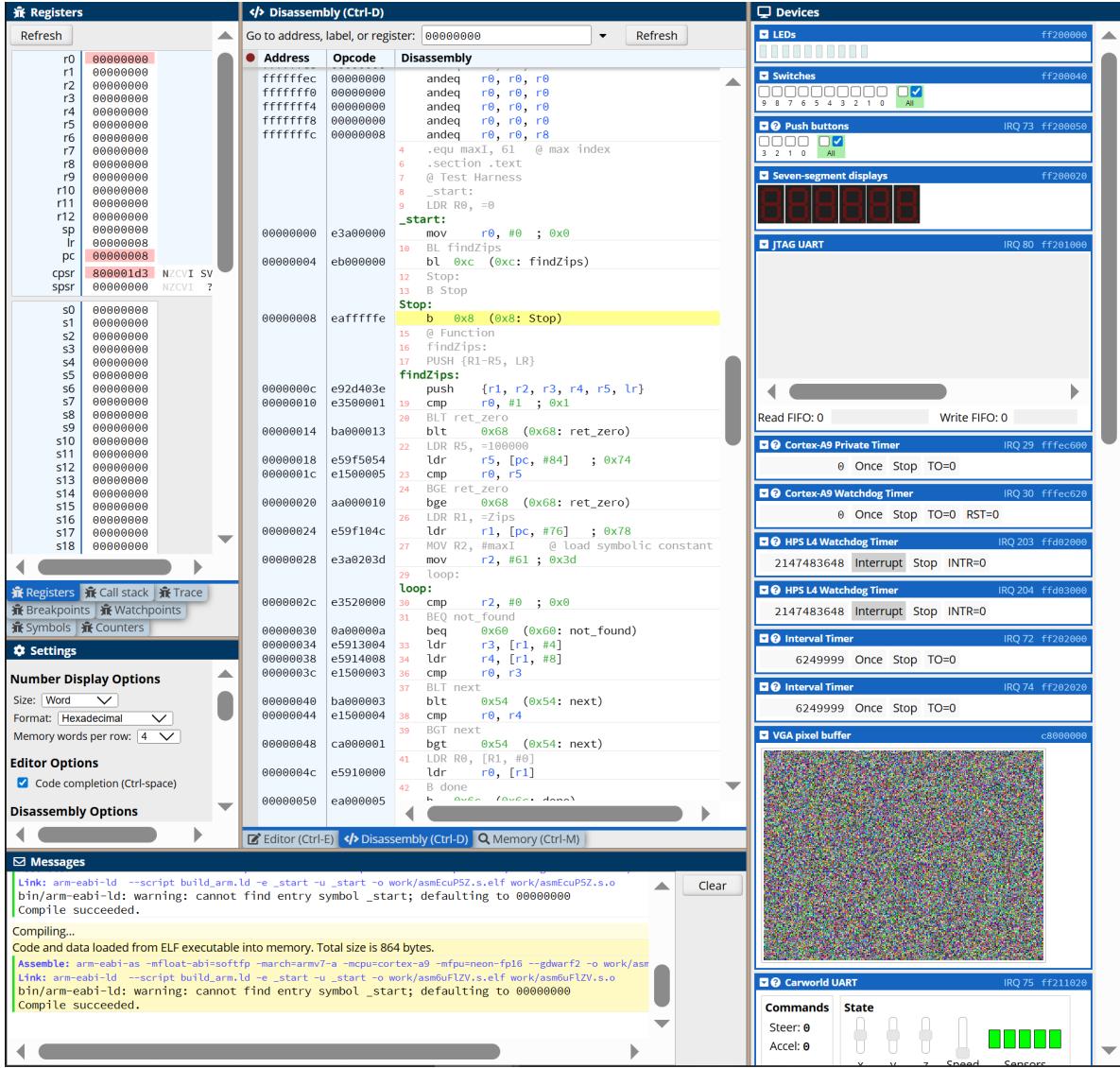


Figure 2: Negative input $-5 \rightarrow R0 = 0$

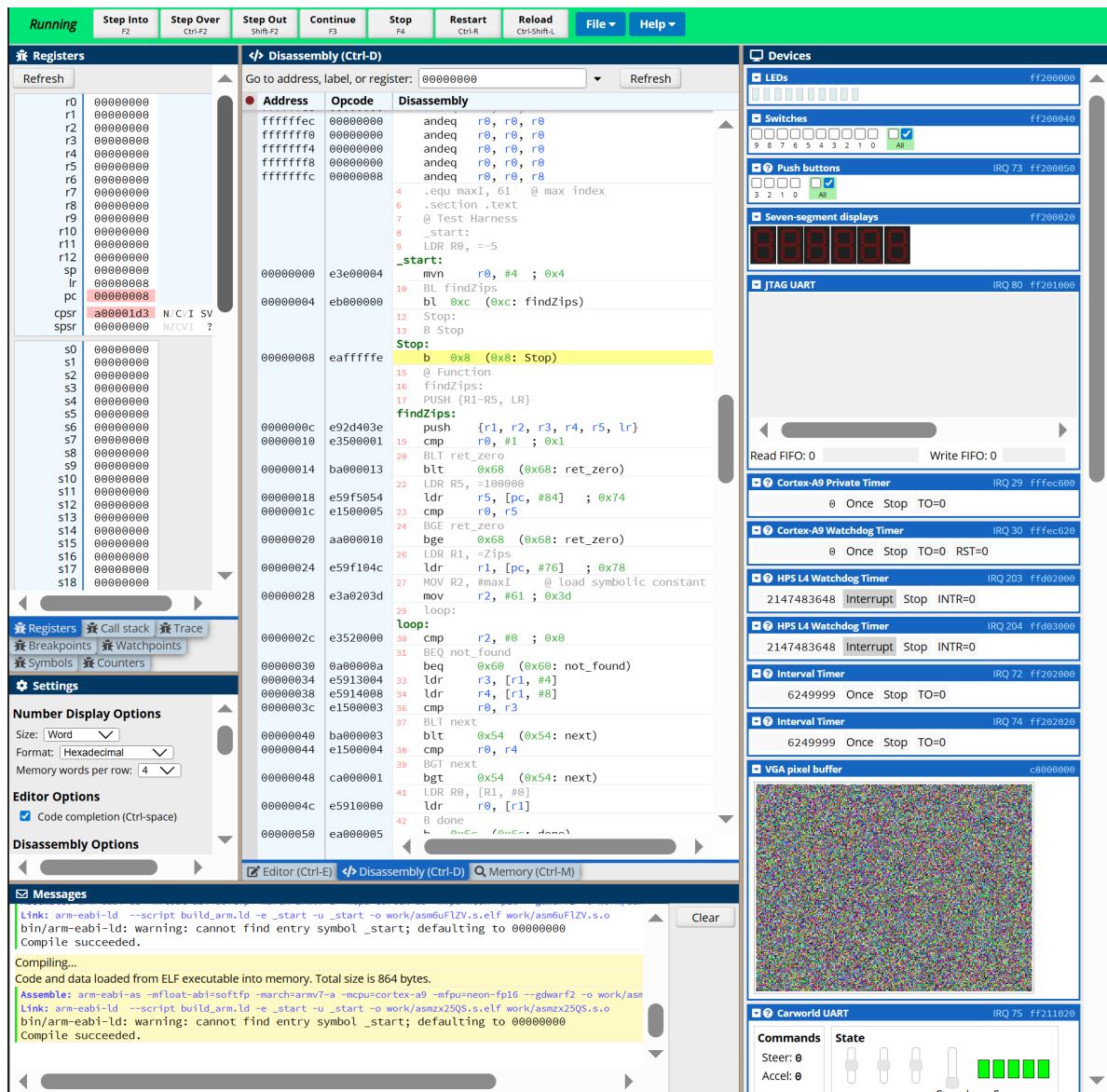


Figure 3: Zero input → R0 = 0

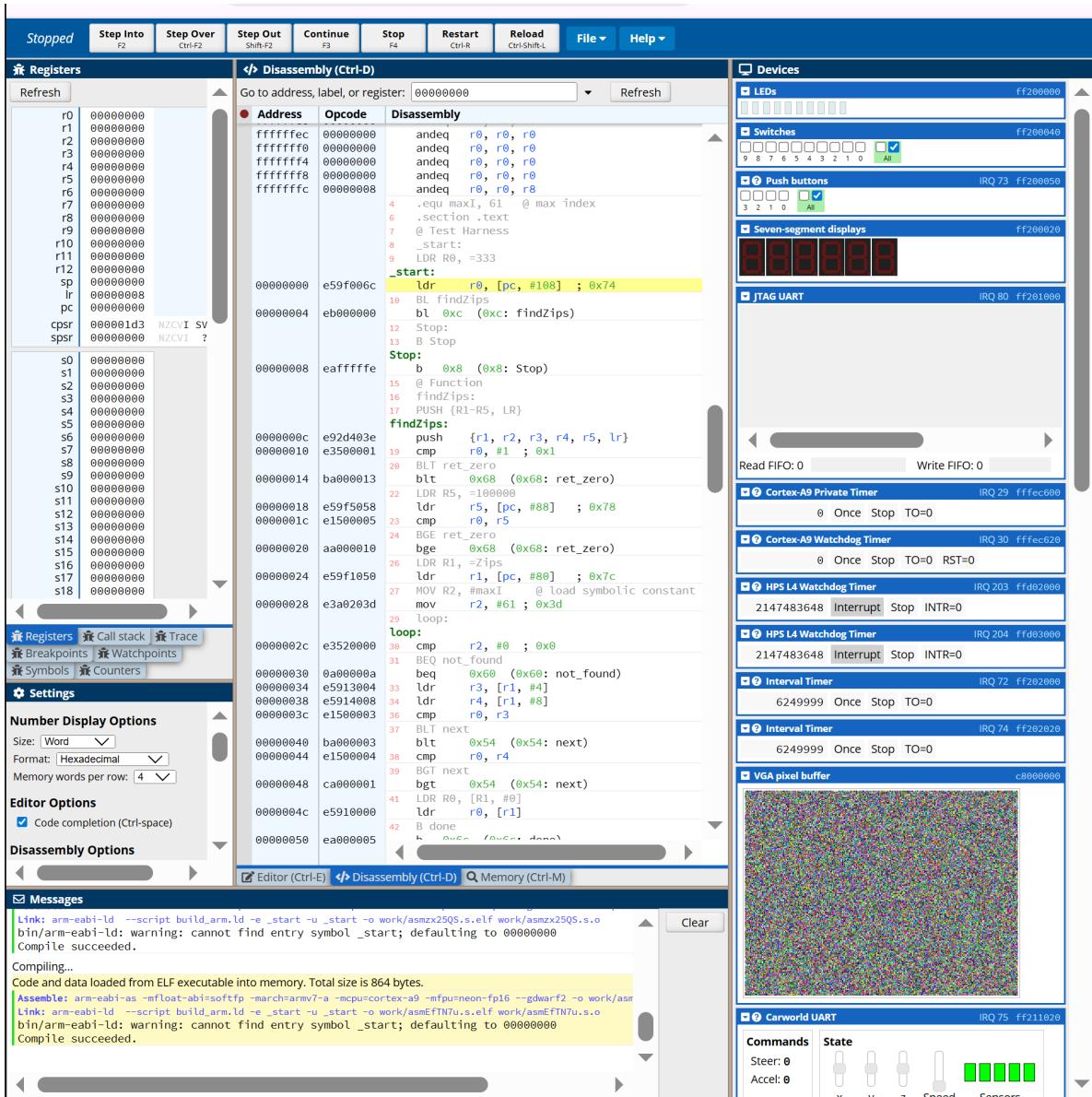


Figure 4: Invalid ZIP 333 (no range) → R0 = 0

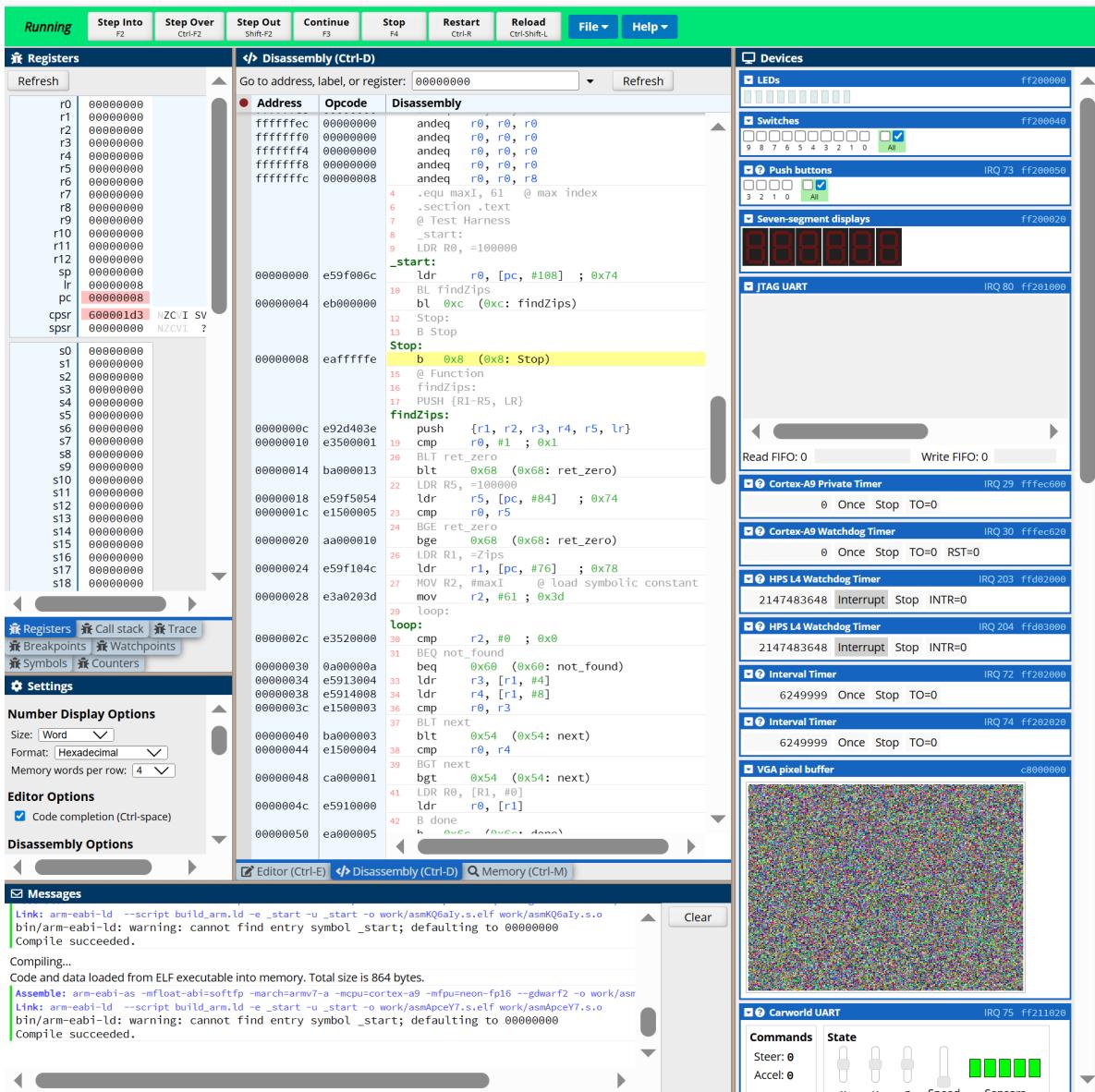


Figure 5: Out-of-range 100000 → R0 = 0

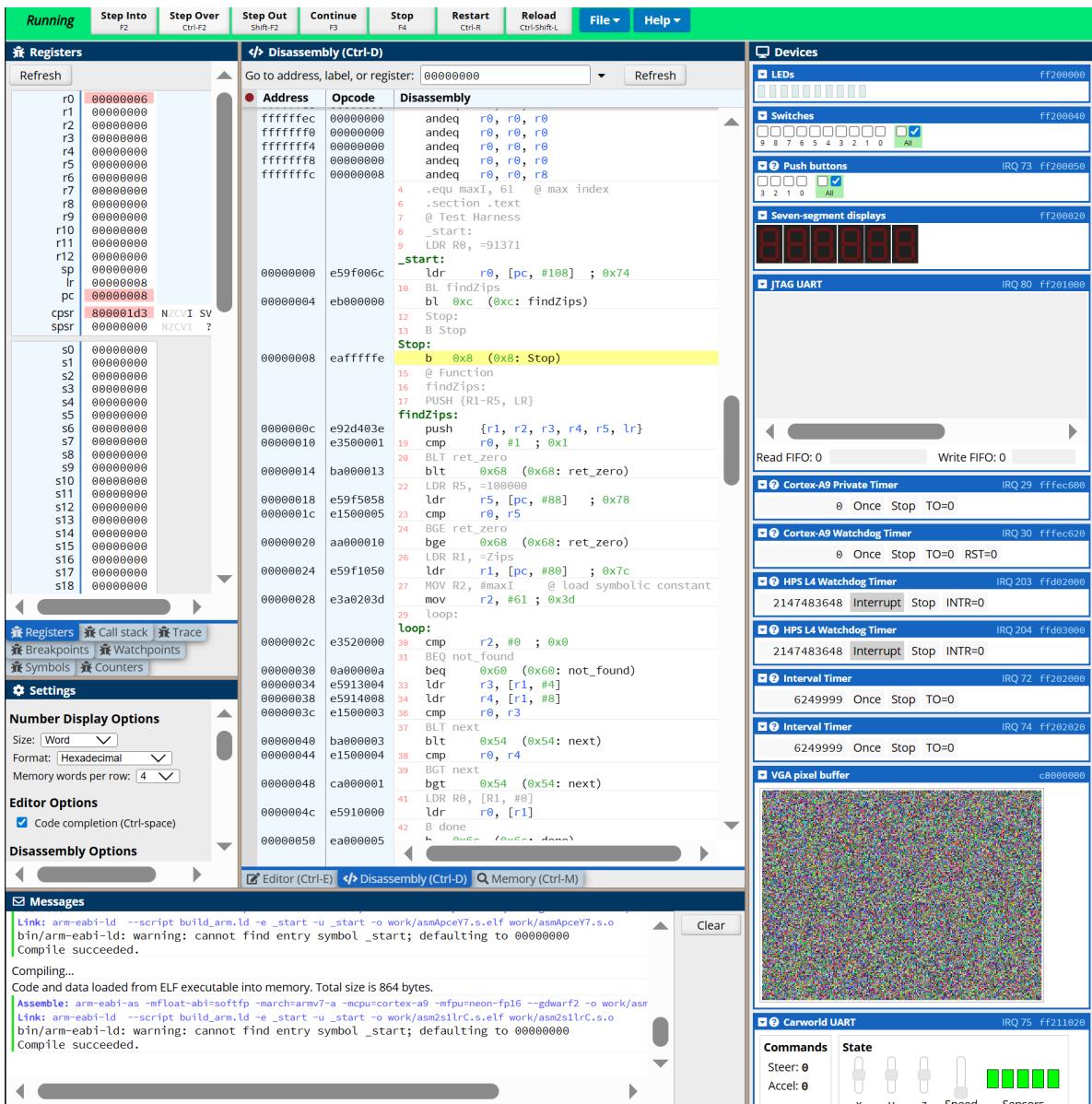


Figure 6: Pierce College ZIP 91371 → R0 = 6 (California)

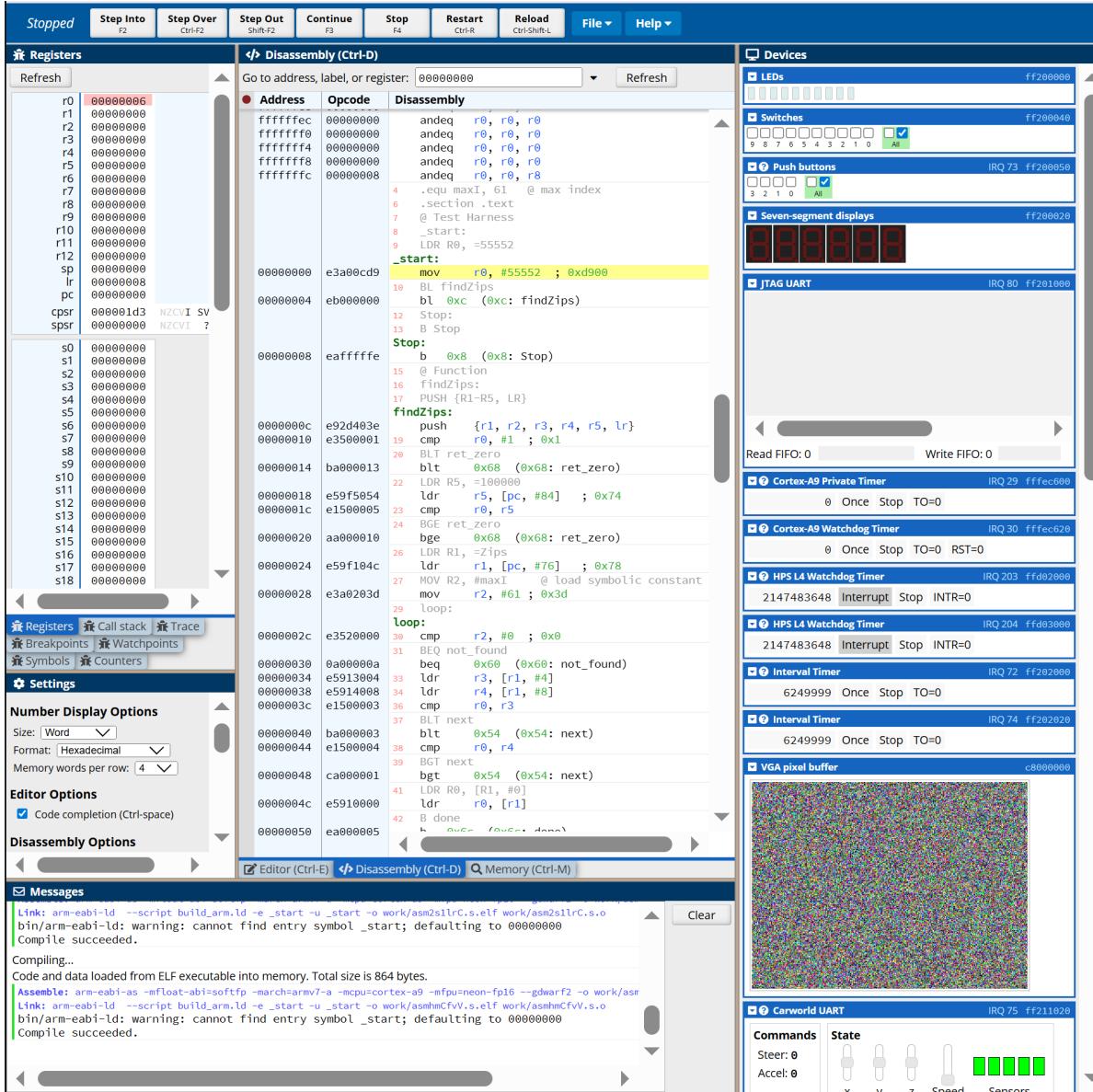


Figure 7: Minnesota ZIP 55552 → R0 = 27

CHECKLIST

- Function named exactly `findZips`
- Correct range validation (> 0 and < 100000)
- 61-entry table with proper labels and 12-byte stride
- Linear search returns state code when $\text{low} \leq \text{ZIP} \leq \text{high}$
- Returns 0 for all invalid cases
- Safe return using `BX LR`
- All required tests pass perfectly on CPUlator

All requirements met – ready for submission.