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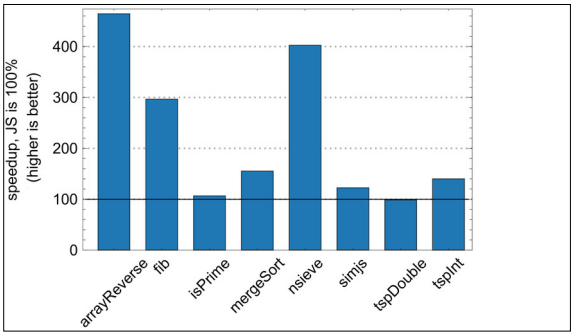
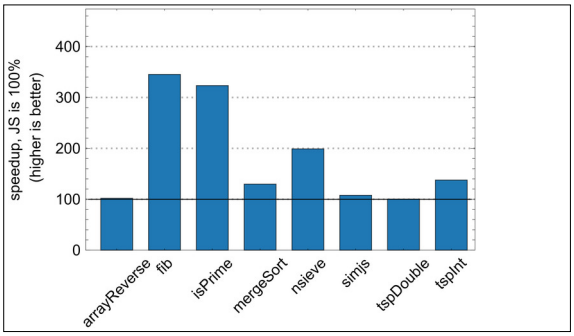
Subject Area	Software and Systems

Accelerate JavaScript Applications by Compiling to WebAssembly



Speedups of the cross compiled implementations relative to regular JavaScript when using Firefox 53.0.



Speedups of the cross compiled implementations relative to regular JavaScript when using Chrome 59.

```
export async function isPrime(value: int) {
    "use speedyjs";

    if (value <= 2) {
        return false;
    }

    const sqrt = Math.sqrt(value) as int;
    for (let i = 2; i <= sqrt; ++i) {
        if (value % i === 0) {
            return false;
        }
    }
    return true;
}

async function main() {
    const prime = await isPrime(2 ** 31 - 1);
    console.log(`isPrime: ${prime}`);
}

```

Prime number check. Speedyjs directive and the type annotations are sufficient to accelerate this with Speedy.js.

Introduction: The importance of JavaScript steadily increased since the web became a ubiquitous application platform. However, its performance is insufficient for many compute-intense applications, even though the JavaScript engines remarkably improved in recent years.

Procedure / Result: This work presents Speedy.js, a statically-typed dialect of JavaScript designed to accelerate compute-intense operations of JavaScript applications. It covers a performance-pitfall-free subset of JavaScript and integrates seamlessly into regular JavaScript code. Using Speedy.js instead of regular JavaScript often requires as little as adding the "use speedyjs" directive. Speedy.js runs in all major browsers as well as in Node.js since it compiles to WebAssembly. The evaluation shows that using Speedy.js over JavaScript for compute intense operations results in a remarkable speedup for most test cases — some-times up to a factor of four. Its cross-browser performance is more consistent than JavaScript's and can be expected to even get steadier with the improving WebAssembly support of browsers.