ARIA
APPLIED RESEARCH IN ACTION

Hardware Accelerated Collision Checking

Improve collision detection latency for robotic manipulators by leveraging SIMD hardware

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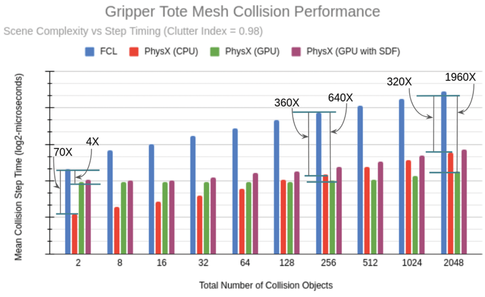

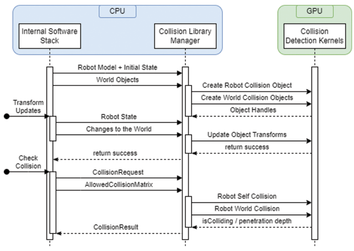

PROJECT SUMMARY

Literature suggests that more than 90% of the time in robotic motion planning is spent in collision checking. In order to tackle this, significant research has been done in developing robust and efficient collision checking algorithms. Such algorithms generally involve binary tree traversals and large scale matrix algebra. Such operations can be accelerated when executed on massively parallelized SIMD hardware. The primary objective of this study is to develop a GPU accelerated framework for collision queries during motion planning tasks with robotic manipulators. The study begins by benchmarking core internal planning algorithms with the existing collision detection library (Flexible Collision Library) as baseline. Subsequently, GPU accelerated physics engines like PhysX and Bullet are evaluated to be used as potential collision detection libraries. Next, simulation scenes with custom mesh geometries are developed using these libraries and the performance in terms of simulation step timing, collision precision and contact generation rate is compared to the baseline. Collision detection with PhysX provided 4-4000X speedup compared to the baseline with 75% collision precision on average. We therefore conclude that collision detection with PhysX can provide substantial performance gains over traditional CPU-based methods.

REFERENCES

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ocado TECHNOLOGY

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