# Potential Improvements

The engine is unstable (especially springs), this could be improved via a mix of several methods:

* Using [*Runge-Kutta integration*](https://en.wikipedia.org/wiki/Runge%E2%80%93Kutta_methods) instead of the currently implemented [*Verlet integration*](https://en.wikipedia.org/wiki/Verlet_integration)*,* as it is much more accurate
* [*Warm starting*](https://allenchou.net/2014/01/game-physics-stability-warm-starting/). Caching the impulses applied in the collision resolution phase, and using it in the next physics step to converge towards the desired solution faster (*typically works best with objects that aren’t moving much between frames*).

# Third Party Libraries

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Library | Description | Version | License | Source Code |
| [GLFW](https://www.glfw.org/) | An open-source windowing library | v3.3.6 | [zlib/libpng license](https://www.glfw.org/license.html) | [GitHub](https://github.com/glfw/glfw) |
| [Glad](https://glad.dav1d.de/) | OpenGL loader library | v0.1.34 | N/A | [GitHub](https://github.com/dav1dde/glad-web) |
| glm | Header only mathematics library | v0.9.9.8 | [Modified MIT License](https://github.com/g-truc/glm/blob/master/copying.txt) | [GitHub](https://github.com/g-truc/glm) |
| ImGui | Immediate-mode Graphical User Interface library | v1.87 | [MIT License](https://github.com/ocornut/imgui/blob/master/LICENSE.txt) | [GitHub](https://github.com/ocornut/imgui) |
| STB | Single-file libraries for C/C++ | N/A | [MIT License](https://github.com/nothings/stb/blob/master/LICENSE) | [GitHub](https://github.com/nothings/stb) |
| [termcolor](https://termcolor.readthedocs.io/) | Header only library to output colored messages to the console | v2.0.0 | [BSD 3-Clause License](https://github.com/ikalnytskyi/termcolor/blob/master/LICENSE) | [GitHub](https://github.com/ikalnytskyi/termcolor) |

# References

Szauer, G. (2017). *Game Physics Cookbook.* Packt Publishing. Retrieved January 2022, from https://www.packtpub.com/product/game-physics-cookbook/9781787123663