

”A new(ish) tool on the workbench”: new version of the population synthesis code SEVN.

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Binary population-synthesis codes are crucial tools to study the evolution of massive binaries and their impact for the demography of Black Holes binaries.

I present a new fully revised version of the population synthesis code SEVN (Stellar EVolution for N-body codes, Spera et al. 2019).

The stellar evolution is computed interpolating from look-up tables containing a grid of stellar evolution models for both Hydrogen and naked Helium stars that can be easily updated. The code includes binary evolution processes (wind and Roche Lobe overflow mass transfer, Common Envelope, stellar mergers, tidal evolution, gravitation wave decay), PPISNe and PISNe prescriptions and different models for SNe and remnants creation. The addition of new binary processes or new SNe models is made simple by the modularity of the code.

With respect to the last SEVN version, we introduce a new adaptive time-step method plus a check-and-repeat schema that guarantees the automatic reduction of the time-step when needed. The new implemented time step has a double advantage: it is capable to follow with extraordinary details the crucial phases of the binary evolution (e.g. RLO) and to drastically reduce the overall computational time (about ten times less with respect to the precedent version). The code is fully parallelised and it adopts a smart dynamic memory allocation. All these properties make SEVN perfectly scalable from personal laptops to large clusters.

In conclusion, SEVN represent a perfect balance between computational resources (both time and memory) and versatility due to the easy update of stellar evolution models. It is a precious tool for the investigation of black holes properties and the interpretation of current and forthcoming detections (e.g. Gravitational Waves or astrometric signals).

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