Galileo Ferraris

Galileo Ferraris' Contest
rules

August 29, 2024

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Motor families

- results datasets will be provided on *three families* of motors (*A*, *B* and *C*) of the same IPM V-type structure.
- each family of motor is referred to a *target* performance
- external dimensions (stator radius and stack length) are defined for each family of motors *A*, *B* and *C*

Family		A	B	C
target		Full electric	Full hybrid	???
Rated torque	[Nm]	236	87	-
Rated power	[kW]	120	36.9	-
Max. speed	[rpm]	15000	13500	-
Stator outer diameter	[mm]	225	264	-
Stack length	[mm]	134	50	-

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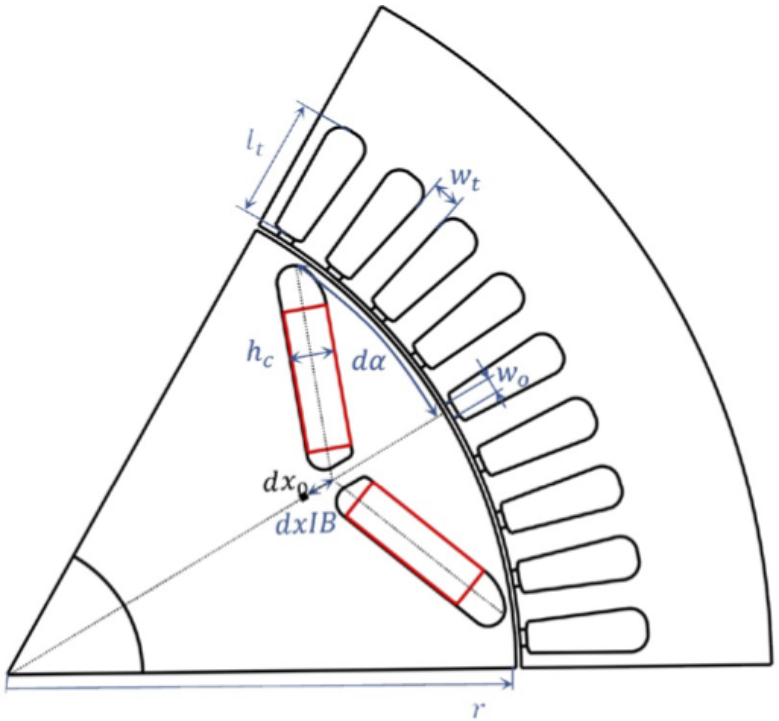
Parametric geometry

- for each motor family, a *parametric* geometry is defined that can be represented as a point in a p dimensional real space
- N points will be generated $\mathbf{x}_k,\ k = 1 \div N$ corresponding to N motor configurations
- internal consistency rules are checked to ensure that each point is leading to a *feasible* motor structure. Unfeasible points are removed from dataset.



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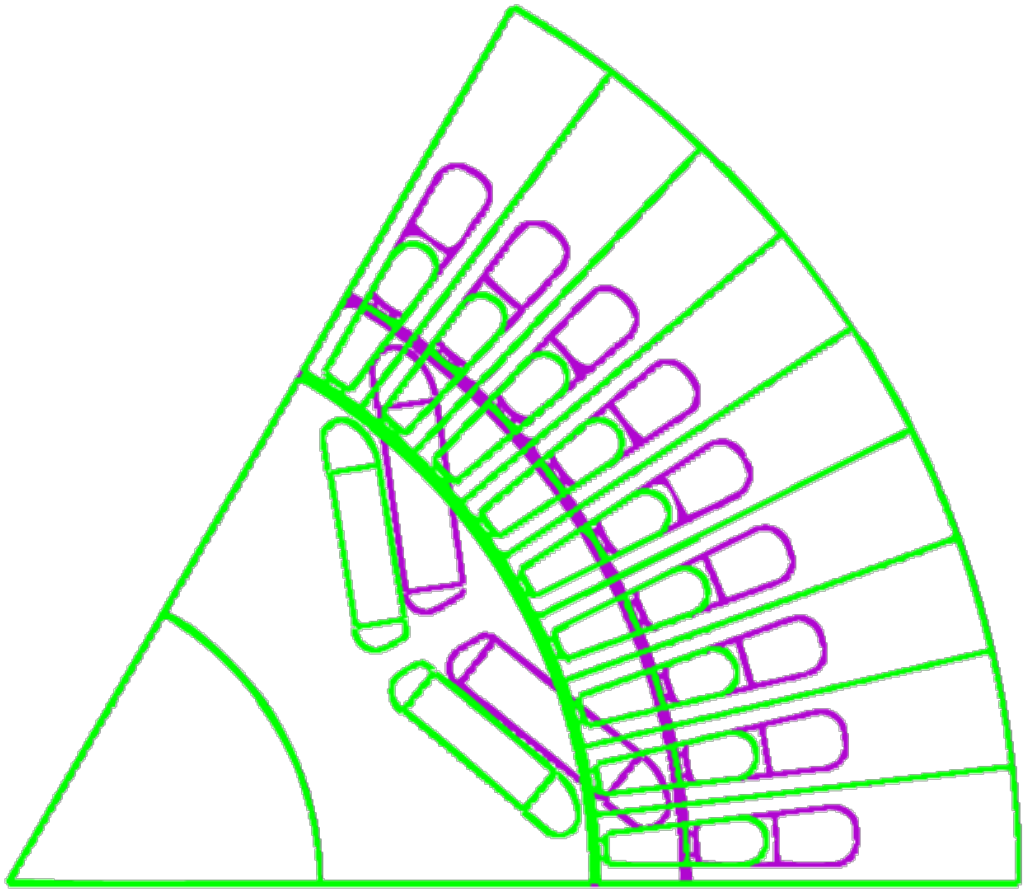
changing rotor radius

Family motor *A*

rotor slot angle $d\alpha = 77°$, rotor radius $r = 65,75\text{mm}$



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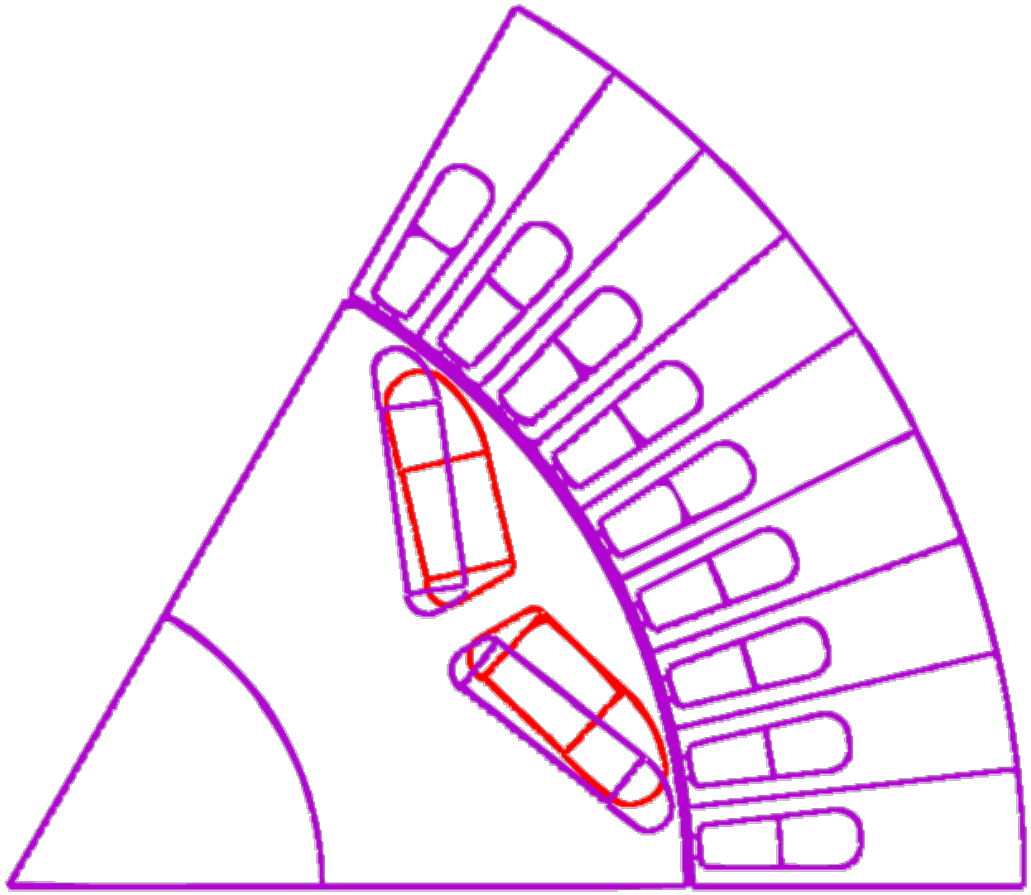
changing rotor slot shape

Family motor *A*

rotor slot angle $d\alpha = 65 \div 77°$, rotor radius $r = 75\text{mm}$



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Contest operative rules

- research groups taking part in the contest should:
  1. build one or more methods to surrogate the relations between the input parameters and the result dataset;
  2. use *complete* datasets from two families of motors (*A* and *B*) to tune their data-driven procedures;
  3. apply them on a third motor *C* where a partial dataset is provided;
  4. predict some key performance indicators on motor *C*, as specified later;
  5. provide to the Organizing Committee the procedures they developed;
  6. explain the methodologies used to reach the results.

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Contest operative rules

- the target of the contest is to assess not only the rated values of a new machine structure (C), but also the extrapolation capability of data-driven procedures to optimize a new machine configuration where a limited set of data is provided.
- procedures will be rerun and results will be evaluated on the basis of accuracy, computational cost and degree of innovation in methods.
- a set of *metrics* to evaluate accuracy of estimated KPI will be used, for instance assessing Pareto front by Reverse generational distance(RGD), Spacing (S), Error ratio (ER), etc.
- *Contest Organizing Committee* will share results coming from the procedure with authors to check their correctness.