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A new insight into Moser's inequality

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We are concerned with the so-called limiting Sobolev case for embeddings of the space $W_0^{1,p}(\Omega)$, where $\Omega \subset \mathbb{R}^n$ is a bounded domain, namely the case when $p = n$, $n \geq 2$. Differently from J. Moser, we consider optimal embeddings into Zygmund spaces: we derive related Euler-Lagrange equations, and show that Moser's concentrating sequences are the solutions of these equations and thus realize the best constants of the corresponding embedding inequalities. Furthermore, we exhibit a group invariance, and show that Moser's sequence is generated by this group invariance and that the solutions of the limiting equation are unique up to this invariance. Finally, we derive a Pohozaev-type identity, and use it to prove that equations related to perturbed optimal embeddings do not have solutions.

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