Optimizing colorant usages in engineering plastic using data-driven methods

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Engineering plastic has been integral to modern human way of life and used prevalently from electronic to automotive applications. Among many advantages in utilizing engineering plastic, one of the key benefits is its colorability. Polymer resins can be offered in various colors via using different plastic colorants prior to processing such as extrusion. Processing conditions such as extruder temperature profile do affect the final color; but most importantly, the type and amount of colorants have the most dominant influence. In order to operate the coloring process efficiently, we propose a data-driven method which optimizes the type and amount of colorants used. First, we developed a numerical model with the visible reflectance spectra data measured from the specimen and the compound recipe composed of the amounts of base resins, plastic additives and colorants. Second, we implemented a gradient method that minimizes the error between the desired target color and the color predicted from the data-driven model. The predictions from the model were assessed by comparing with the experimental results.