Emerging applications of DES addressing the COVID-19 pandemic hospital planning problems can be found in. The review of how simulation modeling can help reduce the impact of COVID-19 was presented in [13]. In these works, the regional disease-spread feature and the heterogeneity in patient pathways were not sufficiently accounted for when modeling the system. For instance, the hospitalization and death rates differ drastically across different age groups, and the age distribution of a population is region-specific. In addition, the patient demand is not stationary and could vary significantly in different phases of the pandemic. Therefore, we propose a hybrid simulation approach to modelling the COVID patient arrival process using system dynamics, and feeding it into a DES that models the operations of a hospital unit in time. The Susceptible-Exposed-Infectious-Recovered (SEIR) model is a type of system dynamics models that has been widely used in predicting infectious disease transmission like severe acute respiratory syndrome (SARS) , H1N1 influenza , and MERS-CoV , where S, E, I, R represent the number of susceptible, exposed, infectious and recovered people separately at a particular time. A datadriven SEIR model is trained using the data of the catchment area of the target hospital.

To allocate scarce resources to individual patients given the bed capacity constraints, we further propose to categorize patients into different types based on the potential consequence, if they cannot be treated timely in the ICU . By categorizing the hospitalization population into high-risk and low-risk groups, we analyzed the effect of implementing control policies including a type-dependent admission control policy, and an early ICU step-down policy based on patient types. Region-specific population characteristics are incorporated to support decision making. The optimal control policy to lower the overall death rate of the patient population is identified for different degree of resource shortage, and a rigorous early step-down policy shows greater potential in surging resource demands.

1.1 CHARACTERISTICS:

- Covid positive patients can book a bed slot by logging in using their SRF ID provided by the government.
- A patient can book Normal bed, HICU bed, ICU bed or Ventilator bed of his choice based on the current health condition.
- A hospital is provided with hospital code, login ID and password to login and update the available bed slots on the particular day