Procedural Generation of Patient Scenarios for Medical Diagnosis Training

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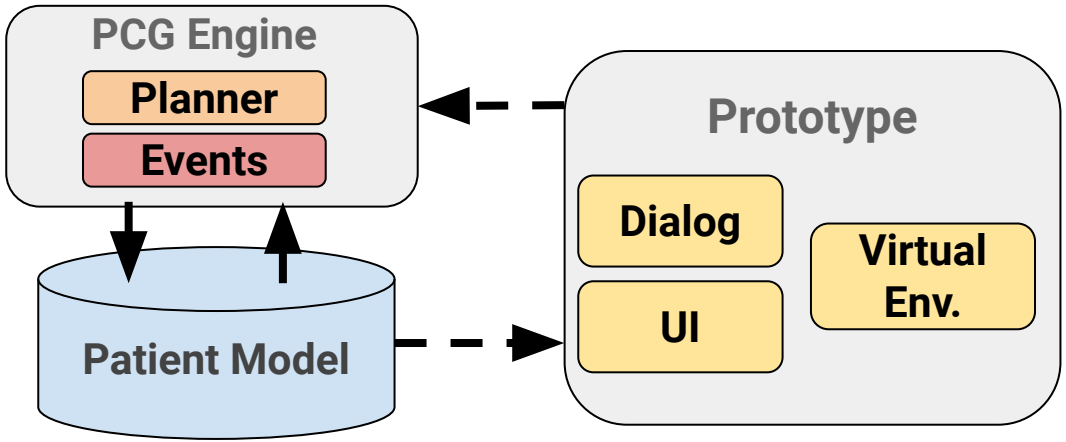
What are we doing? Why?

Today, the process of authoring patient scenarios for diagnostic training is largely **manual**. Manual authoring is **error prone** and **time-intensive**, which greatly limits scenario **quantity** and **variety**.

Approach

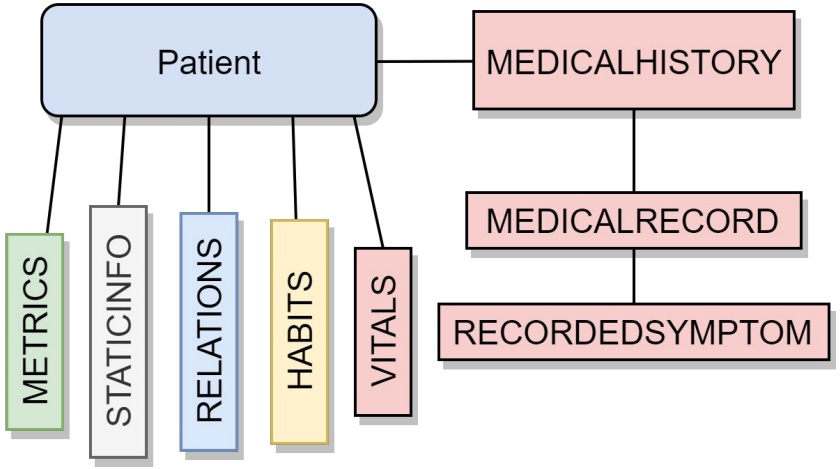
Our system is comprised of:

- Underlying patient data model
- A procedural algorithm - C#
- A prototype virtual environment - Unity



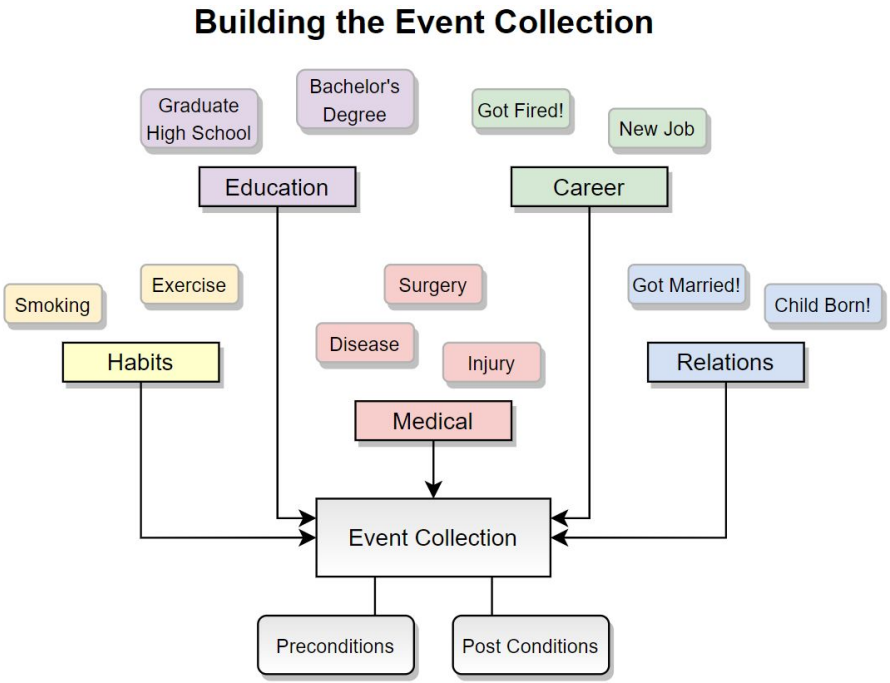
The Patient Model

To generate a rich, realistic patient, the attributes or model of what represents a patient must first be established.



Procedural Generation

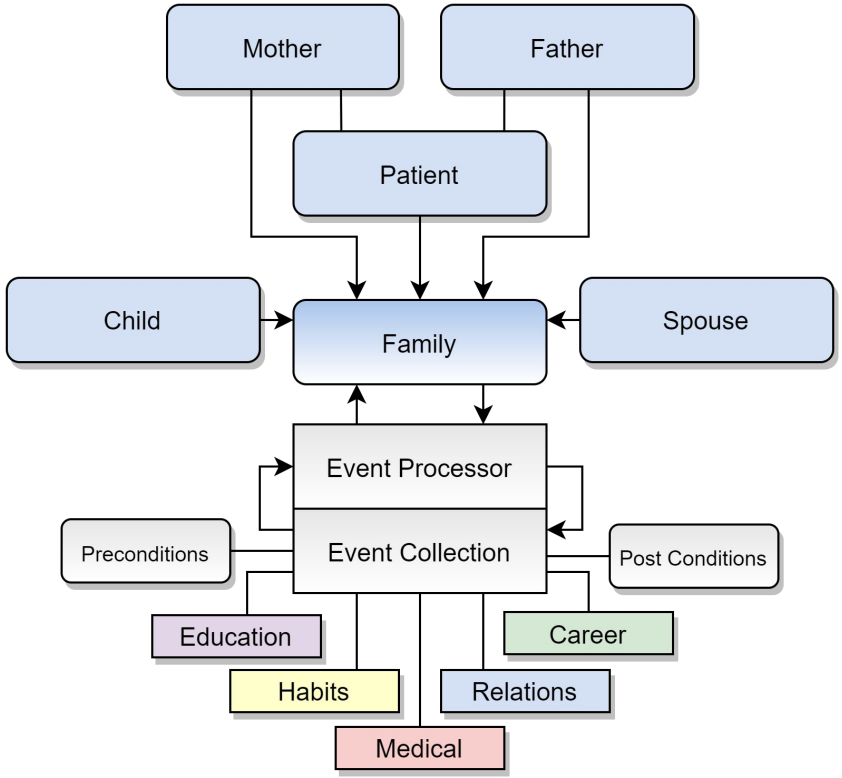
- Simulating the complexity of a human life.
- Life experiences are categorized into a collection of generic events.



Making virtual families

…and making them sick.

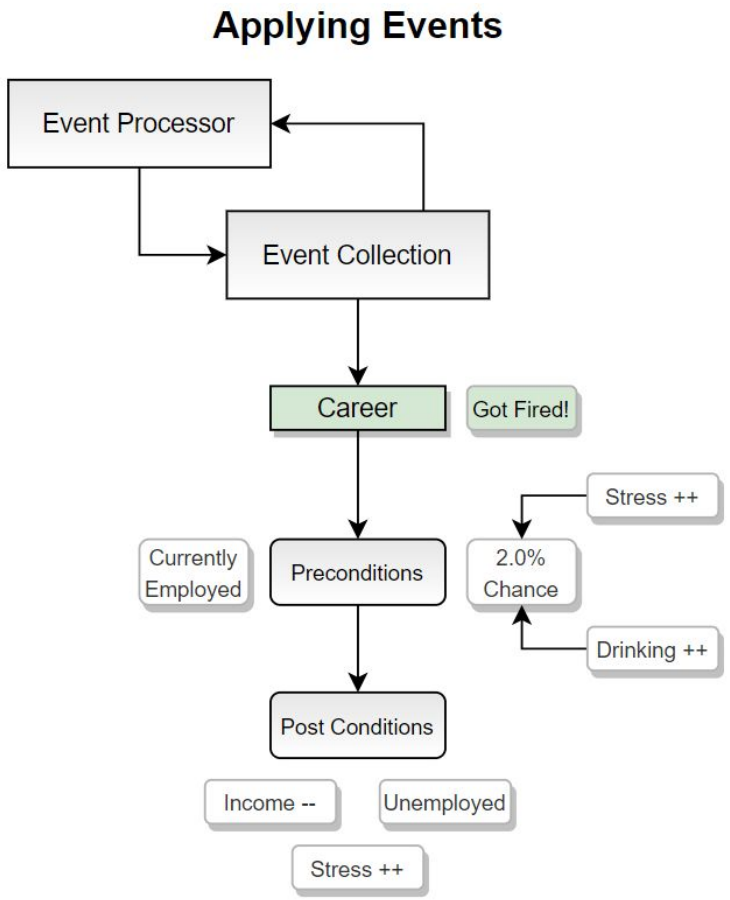
- Generated in realistic sequence.
- Patient inherits traits from parents.
- Patient can get married and have children.
- Once established, the family grows together.
- Events experienced by one family member can affect the others.



A “life” is a Series of Events

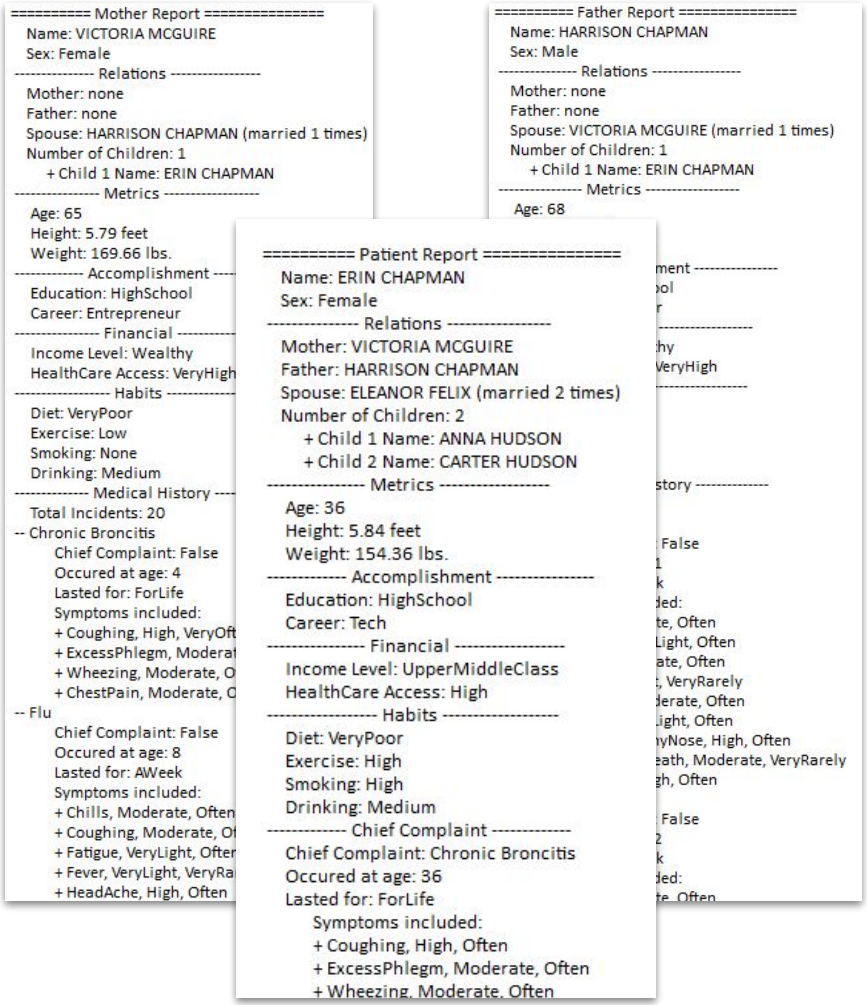
Every change has a cause

- Each event has:
  - Preconditions
    - Influenced by past events
    - Ensures event has proper context
  - Post Conditions
    - Makes changes to patient's state that influence future events



The Full Picture

- More than just medical history.
- Capturing the ambiguity of real life.



The Prototype

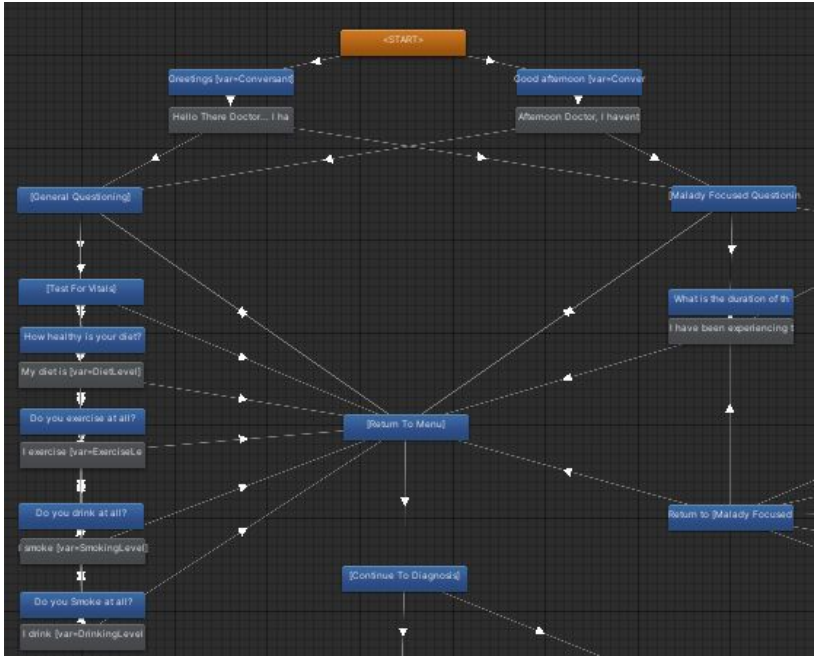
This is the environment in which the doctor will interact with the patient.

User Interface

The user interface is the medium for displaying information to the user during diagnosis.

The Dialogue System

This system provides a way for the user to interact with the patient, through the use of dialogue



Evaluation

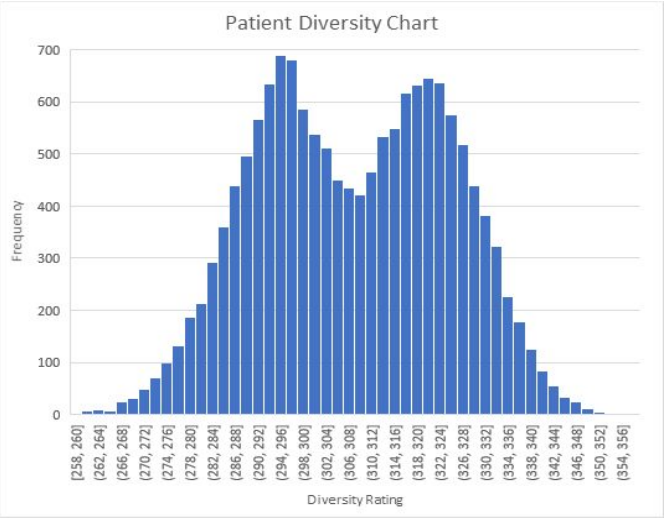
For evaluation, 15k patients were generated and analyzed for effectiveness.

Effectiveness was evaluated based on:

- Validity
- Diversity
- Efficiency → F(n) = ~1500n, where n = Minutes

Evaluation of our system concludes that patient data is:

- **Valid** ✅ **Diverse** ✅ and can be **Rapidly Generated** ✅



Moving Forward & The Future!

- Tuning, Tuning, Tuning...
- Broaden the domain of maladies from only Respiratory to others such as Cardiovascular, Digestive, Nervous, ...
- Evaluation of patients by a medical professional
- IRB (Institutional Review Board)

Demo & Questions