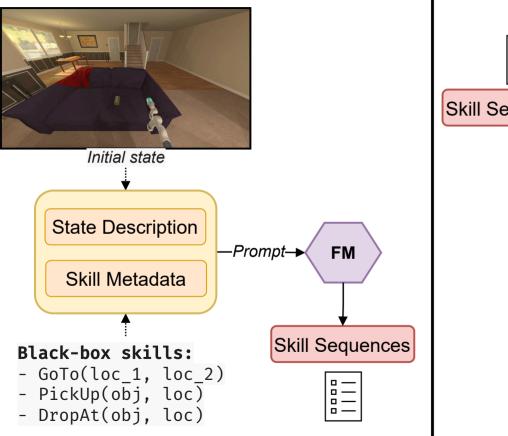
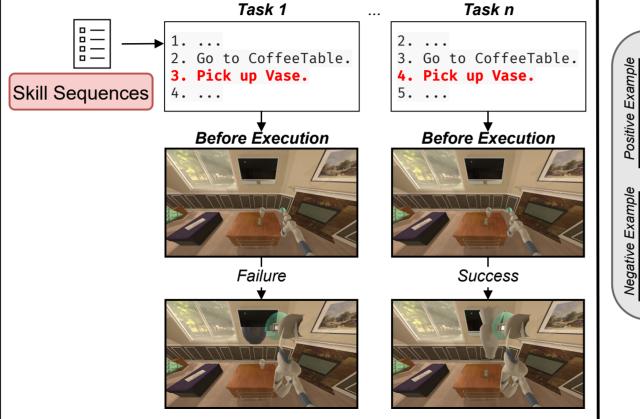
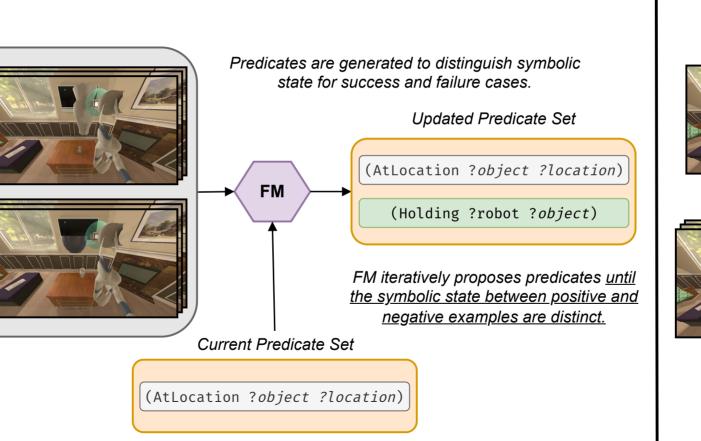
Phase 1: FM proposes robot skill sequences given black-box skill metadata and state description for learning operators.



Phase 2: Robot attempts to execute each proposed sequence step-by-step until success or failure is encountered.



Phase 3: FM is presented images of <u>positive</u> (success) and <u>negative</u> (failure) cases to generate predicates useful for learning skill operators.



Phase 4: Using all candidate predicates, we factorize the symbolic state to construct skill operator definitions that characterize these skills. Operator for PickUp skill *Images* Symbolic state Before Execution (AtLocation ?object ?location) Before (At?robot ?location) (IsReachable ?object) (IsFreeHand ?robot) FM After Execution After (IsHolding ?object)

Predicate Set

(AtLocation ?object ?location)

(IsFreeHand ?robot)