

# 基于历史事件日志挖掘的智能家居场景TAP规则生成

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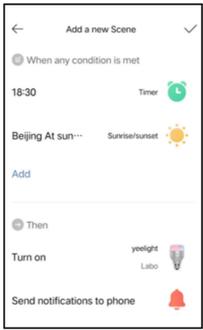
## Generating Scenario-Centric TAP Rules for Smart Homes by Mining Historical Event Logs

The 30th IEEE International Conference on Web Services (ICWS'23)

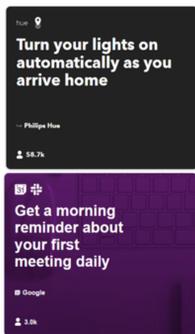
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### 以场景为中心的TAP规则

#### Scenario-centric TAP rules

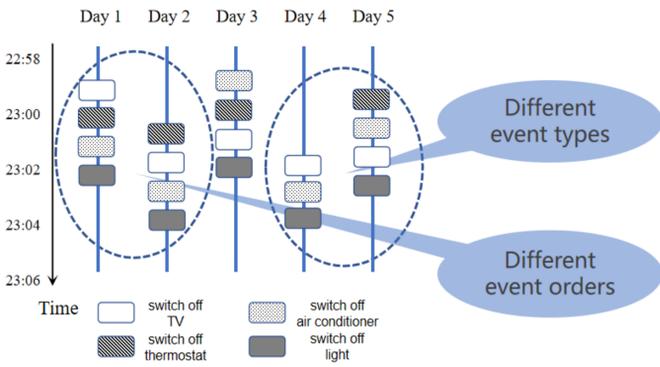


#### Simple TAP rules



- TAP (Trigger-Action Programming) 是智能家居常见的终端用户编程范式
- 以场景为中心的TAP规则
  - 实现用户的场景化意图
  - 包含更多的事件
  - 满足更复杂的用户需求

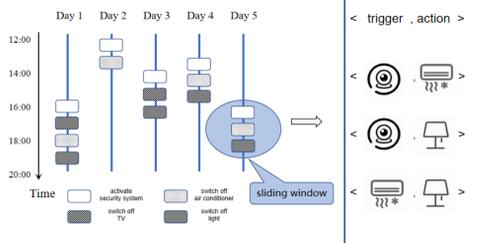
Activity: Sleeping



- 场景TAP规则的编写较为复杂, 需要用户拥有一定的领域知识, 同时明确自身的需求
- 用户活动以及潜在场景的随机性 (相同活动下用户执行设备操作的数量和顺序的变化) 导致传统频繁序列模式挖掘算法不再适用

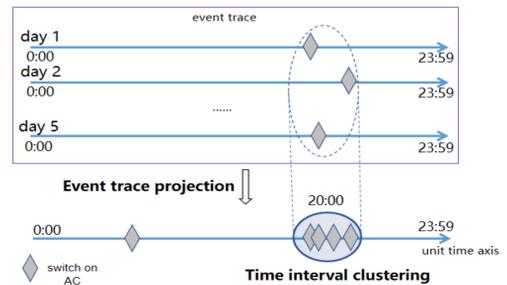
### 基于历史事件日志挖掘的场景TAP规则生成方法

#### Event-triggered event pairs



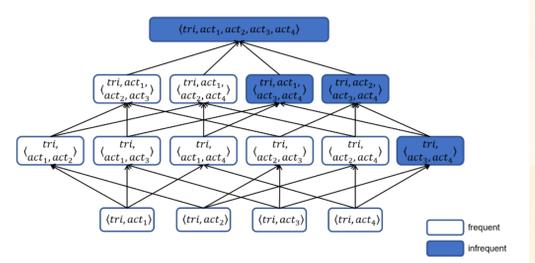
#### 基于时间间隔, 对投影在单位时间轴上的事件进行聚类

#### Time-triggered event pairs

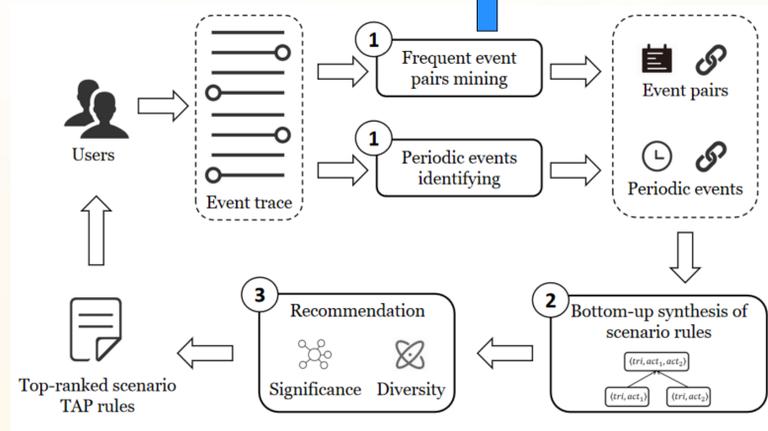


#### 自底向上的关联场景TAP规则合成

#### SGen merges scenario rules bottom-up based on a breadth-first search strategy



基于滑动时间窗口的频繁事件对挖掘



### 实验评估

#### 准确率

Can the TAP rules generated by SGen match users' scenarios?

Align with the preset scenarios

Rank	TAP rule	Activity
1	IF HallToiletDoor changes to off, THEN HallBathroomDoor switches on, HallBathroomDoor switches off, ToiletFlush switches on and ToiletFlush switches off	Leave house
2	IF HallBedroomDoor changes to on, THEN HallBathroomDoor switches on, HallBathroomDoor switches off, ToiletFlush switches on and ToiletFlush switches off	Use toilet
3	IF PlatesCupboard changes to off, THEN Fridge switches on, Fridge switches off, GroceriesCupboard switches on and GroceriesCupboard switches off	Take shower
4	IF CupsCupboard changes to on, THEN Fridge switches on and Fridge switches off	Go to bed
5	IF Freezer changes to off, THEN Fridge switches on and Fridge switches off	Prepare Breakfast
		Prepare Dinner
		Get drink

Rule	Dataset	Precision@3	Precision@5	Precision@7
ETS	Kasteren	100%	100%	71.4%
	SGData	100%	-	-
TTS	Kasteren	100%	80%	71.4%
	SGData	100%	-	-

Precision@k are all over 70%

#### 有效性

Are the scenario rules generated by SGen efficient in meeting user requirements?

Coverage of the top 10 simple rules generated by TAGen

