# Stochastic Energy Optimization for Mobile GPS Applications – Supplemental

Anonymous Author(s)

**ACM Reference Format:**
Anonymous Author(s). 2018. Stochastic Energy Optimization for Mobile GPS Applications – Supplemental. In *Proceedings of The 26th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2018).* ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/nnnnnnn.nnnnnnn

## 1 OVERVIEW

This document provides supplemental material for the AENEAS project. Included are:

- (1) The AENEAS library github page that provides the library used to build android applications.
- (2) The AENEAS model github page that provides the source code used for our model, as well as the data logs collected.
- (3) The `MAPS.ME` android source code edits used to benchmark AENEAS, as well as the data logs collected while driving, biking, and hiking.
- (4) Additional figures.

## 2 PROJECT GITHUB PAGES

We give a brief overview about each project github page.

### 2.1 AENEAS Libary

We provide the AENEAS library at https://github.com/pl-aeneas/aeneas. Included at the project page are instructions for building and linking the library.

*AENEAS Logs.* AENEAS logs to a file called "stoke.log" that contains information on interactions, energy, reward, time, and configurations. We include these log files, as they are the "raw data" gathered from our model and `MAPS.ME` experiments.

### 2.2 AENEAS Model

We provide the AENEAS model at https://github.com/pl-aeneas/aeneas-model. Included at the project page are instructions for building and running the model. `src/model/Simulator.java` provides a detailed example of using the AENEAS framework without the overhead of installing and running an android application.

In addition, we provide the set of raw data collected for Section 6: Model-Based Design of our paper. The `dump/normal-error-100` directory contains the data. The directory structure is as follows. We display one "stoke.log" for simplicity:

- (1) `no-error`
  - (2) `1arm_narrow`
    - (3) `epsilon0-100-500`
      - `stoke.log`
  - (2) `1arm_wide`
  - (2) `2arm`
  - (2) `3arm`
- (1) `5p-error`
- (1) `10p-error`
- (1) `20p-error`

The directories at level (1) correspond to the error rate injection simulating the noisy environment—`no-error` is the default, noise-free environment. The directories at level (2) correspond to the application profiles. The directories at level (3) correspond to the exploration policies. Each level (3) directory contains a file `stoke.log` which is the raw data log produced by AENEAS.

### 2.3 `MAPS.ME` Benchmark

We provide our modified `MAPS.ME` android application at https://github.com/pl-aeneas/aeneas-mapsme. Included are instruction for building and running the application.

In our paper, we break our evaluation into four experiments, (1) Declared Discrete Knob, (2) Inferred Interval, (3) Stochastic vs Non-Stochastic, and (4) Self Optimizer. The `run` directory contains a folder with raw data and scripts to run these experiments, titled (1) discrete-sla, (2) inferred, (3) machine, and (4) self-optimize. Furthermore, we provide the battery drain, model collection, and overhead data as well. The directory structure is as follows, with data from key figured in the paper highlighted. We display one "stoke.log" for simplicity.

- `battery-drain`
- `data-collection`
- `discrete-sla`
  - `dis-drive-vdbe/20`
    - stoke.log
  - `dis-drive-vdbe30`
  - `dis-bike/20`
  - `dis-bike/30`
  - `dis-hike/20`
  - `dis-hike/30`
  - `dis-drive-profile1/30`
  - `dis-drive-profile2/30`
  - `dis-drive-profile3/30`
- `inferred`
  - `inf-drive`
    - `d4/20`
    - `d4/30`
  - `inf-bike`
    - `b1/20`
    - `b1/30`


*ESEC/FSE 2018, 4âĂŞ9 November, 2018, Lake Buena Vista, Florida, United States*

ACM ISBN 978-x-xxxx-xxxx-x/YY/MM…$15.00
https://doi.org/10.1145/nnnnnnn.nnnnnnn

  - inf-hike
    * h1/20
    * h1/30
- machine
  - oracle
  - pessimist
  - static1
  - static2
  - static3
  - vbde50
- overhead
- self-optimize

In addition, the `explore` directory contains hours of exploratory data collection.

# 3 ADDITIONAL IN-FIELD EVALUATION

## 3.1 Energy Optimization for Declared Discrete Knob

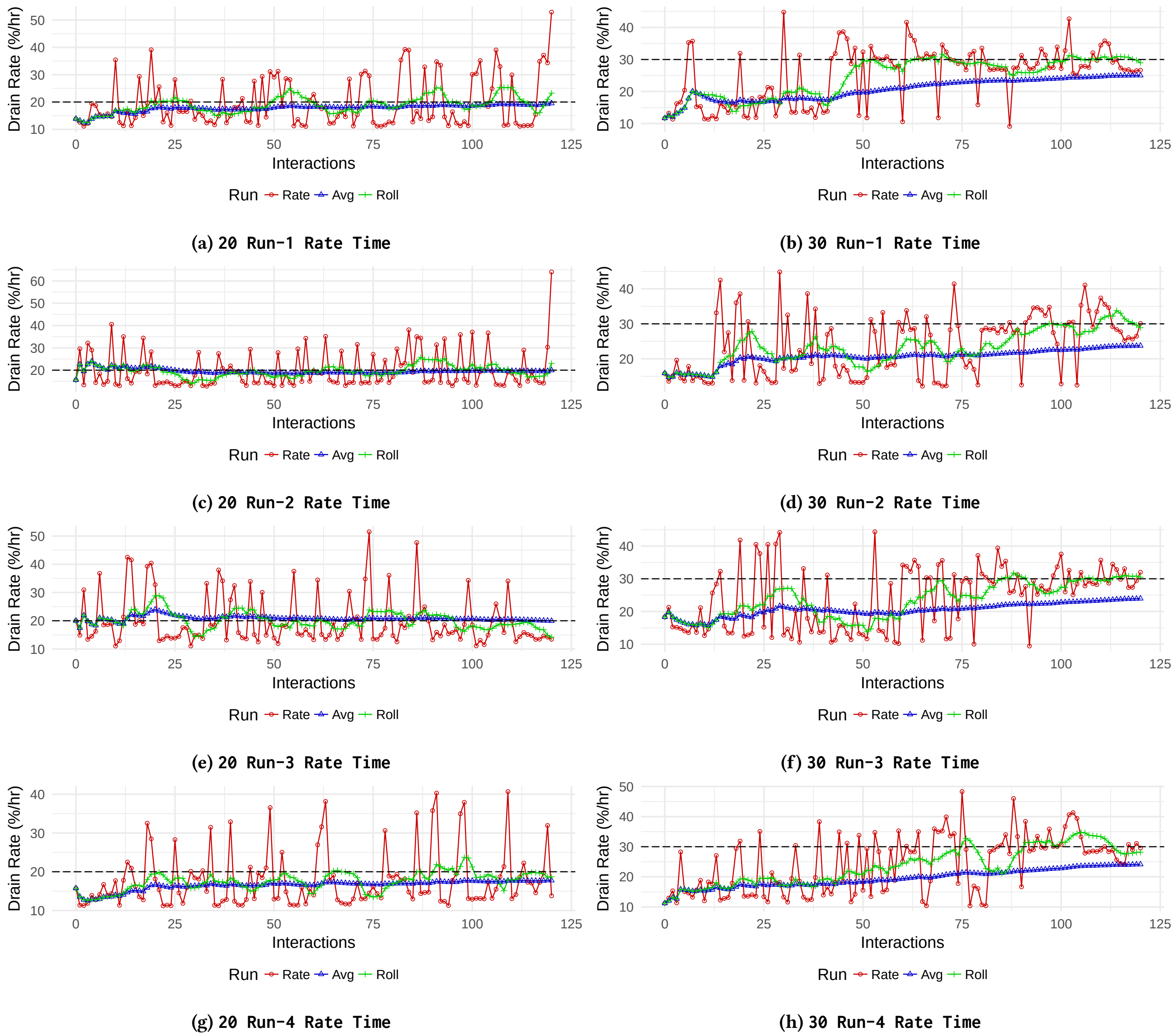
In this section we provide the additional data for our Declared Discrete Knob experiments. All runs for driving, biking, and hiking are presented in Figure 1, Figure 3, and Figure **??**, respectively.

## 3.2 Energy Optimization for Inferred Interval

In this section we provide the additional data for our Inferred Interval experiments. All runs for driving, biking, and hiking are presented in Figure 4, Figure 5, and Figure 6, respectively.

## 3.3 Stochastic vs Non-Stochastic Approaches

In this section we provide the additional data for our Profile-Guided experiments. All runs for `Profile-1`, `Profile-2` and `Profile-3` are presented in Figure 7, Figure 8, and Figure 9, respectively.




(a) 20 Run-1 Rate Time

(b) 30 Run-1 Rate Time

(c) 20 Run-2 Rate Time

(d) 30 Run-2 Rate Time

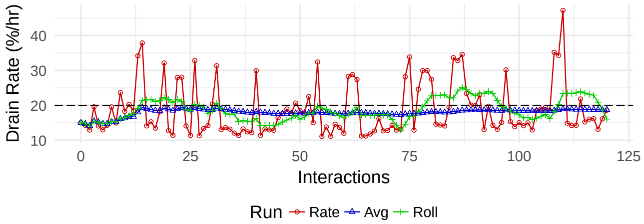
(e) 20 Run-3 Rate Time

(f) 30 Run-3 Rate Time

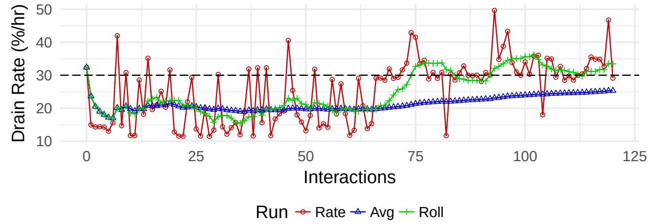
(g) 20 Run-4 Rate Time

(h) 30 Run-4 Rate Time

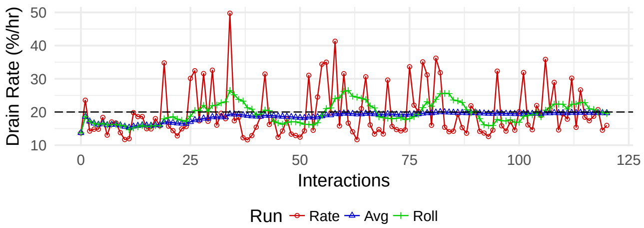
**Figure 1: Declared Discrete Knob Driving Runs**



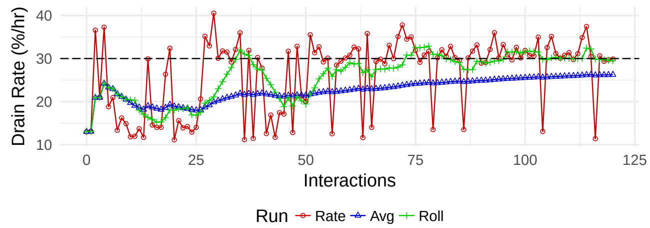

(a) `20 Run-1 Rate Time`




(b) `30 Run-1 Rate Time`

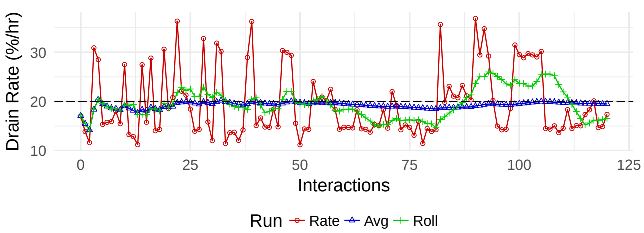



(c) `20 Run-2 Rate Time`



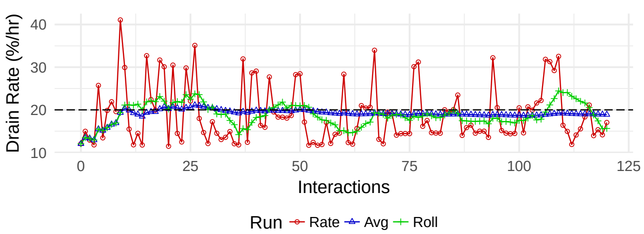

(d) `30 Run-2 Rate Time`

**Figure 2: Declared Discrete Knob Biking Runs**

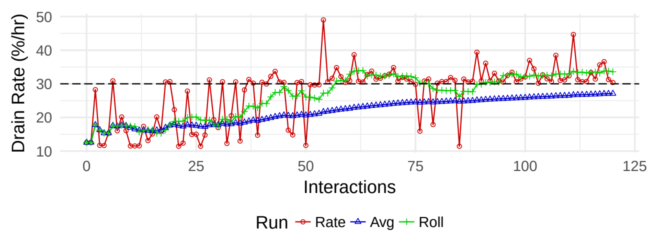



(a) `20 Run-1 Rate Time`


(b) `30 Run-1 Rate Time`

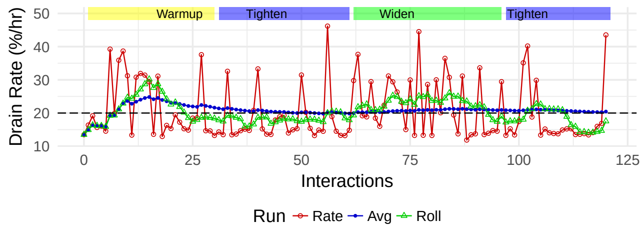



(c) `20 Run-2 Rate Time`

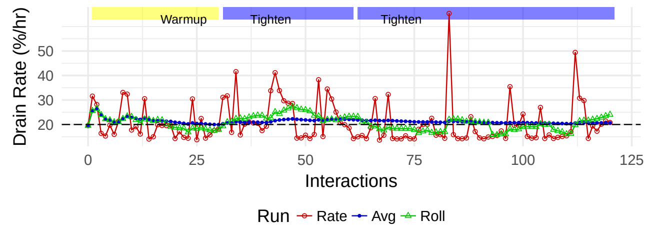



(d) `30 Run-2 Rate Time`

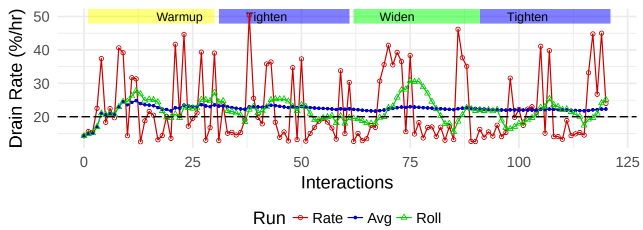
**Figure 3: Declared Discrete Knob Hiking Runs**



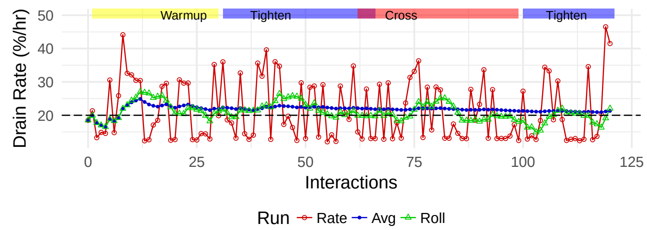

(a) `20%/hr SLA Run-1`



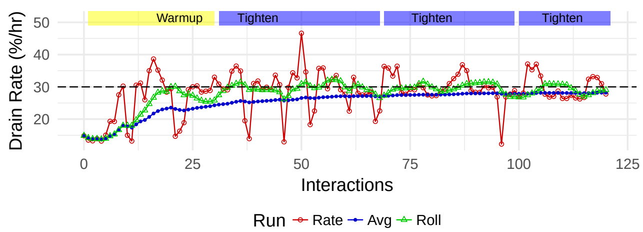

(b) `20%/hr SLA Run-2`



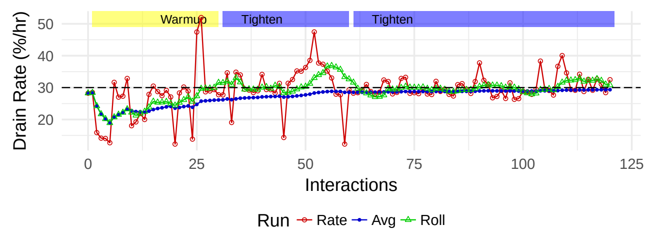

(c) `20%/hr SLA Run-3`




(d) `20%/hr SLA Run-4`

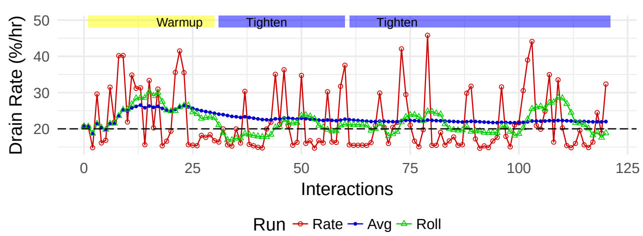



(e) `30%/hr SLA Run-1`

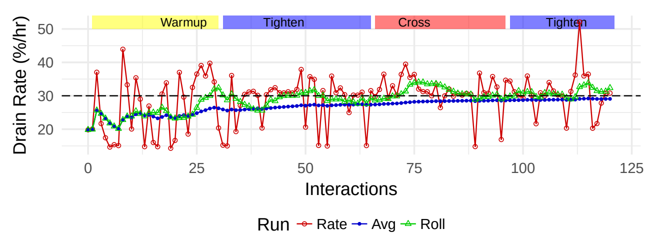



(f) `30%/hr SLA Run-2`

**Figure 4: Inferred Interval Driving Runs**

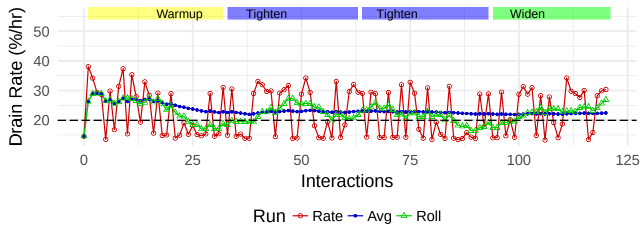



(a) `20 %/hr SLA`



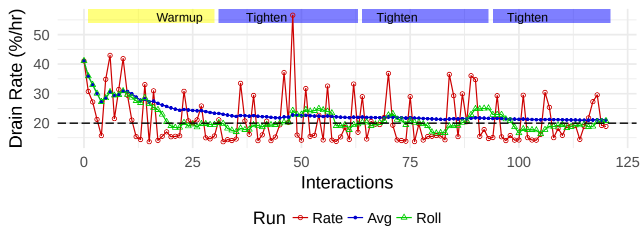

(b) `30 %/hr SLA`

**Figure 5: Inferred Interval Biking Runs**

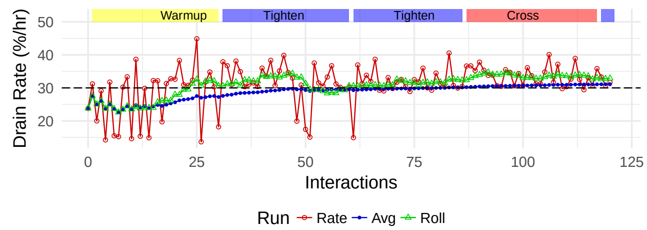



(a) `20 %/hr SLA Run-1`


(b) `30 %/hr SLA Run-1`

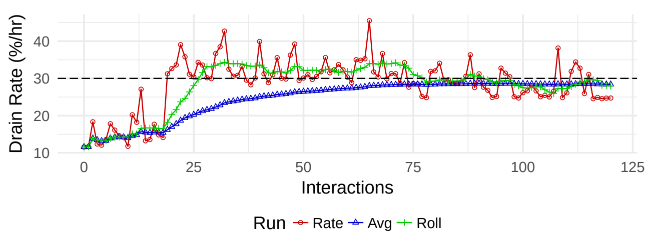



(c) `20 %/hr SLA Run-2`

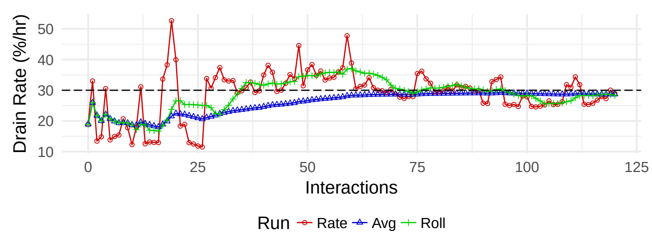



(d) `30 %/hr SLA Run-2`

**Figure 6: Inferred Interval Hiking Runs**

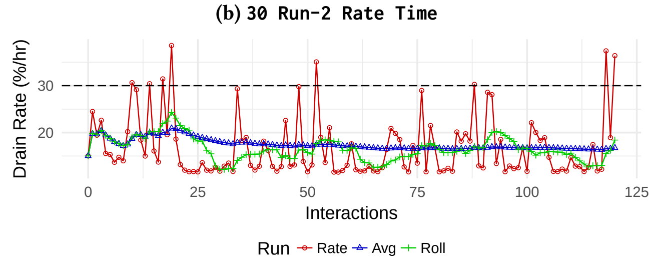



(a) `30 Run-1 Rate Time`



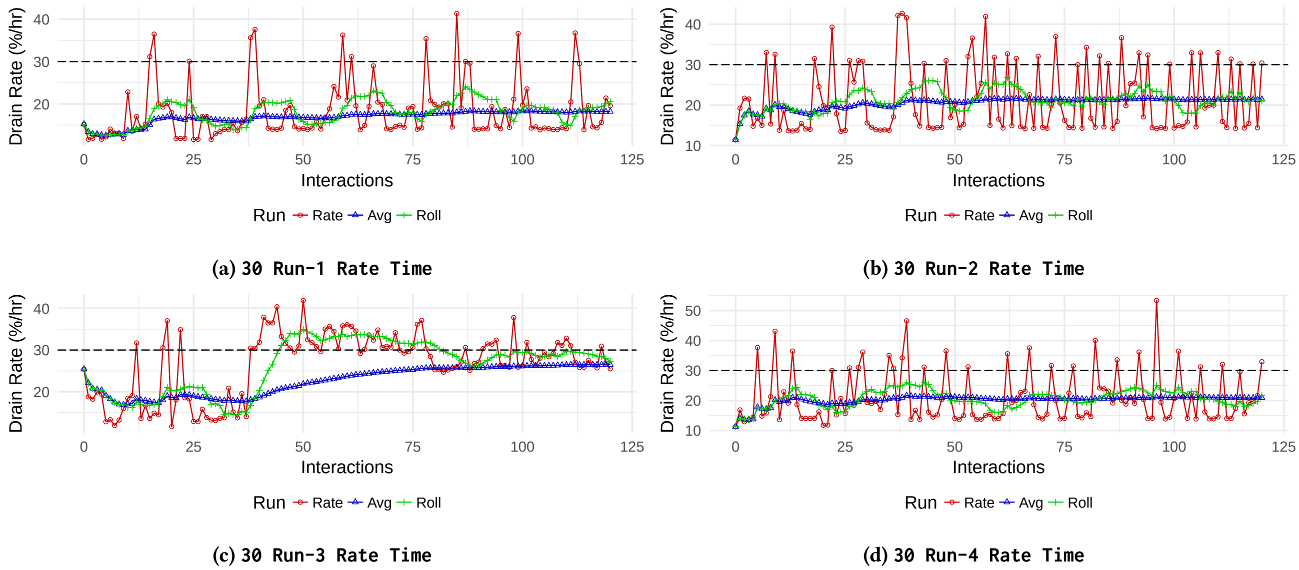

(b) `30 Run-2 Rate Time`


(c) `30 Run-3 Rate Time`




(d) `30 Run-4 Rate Time`

**Figure 7: Profile-1 Discrete Knob Driving Runs**



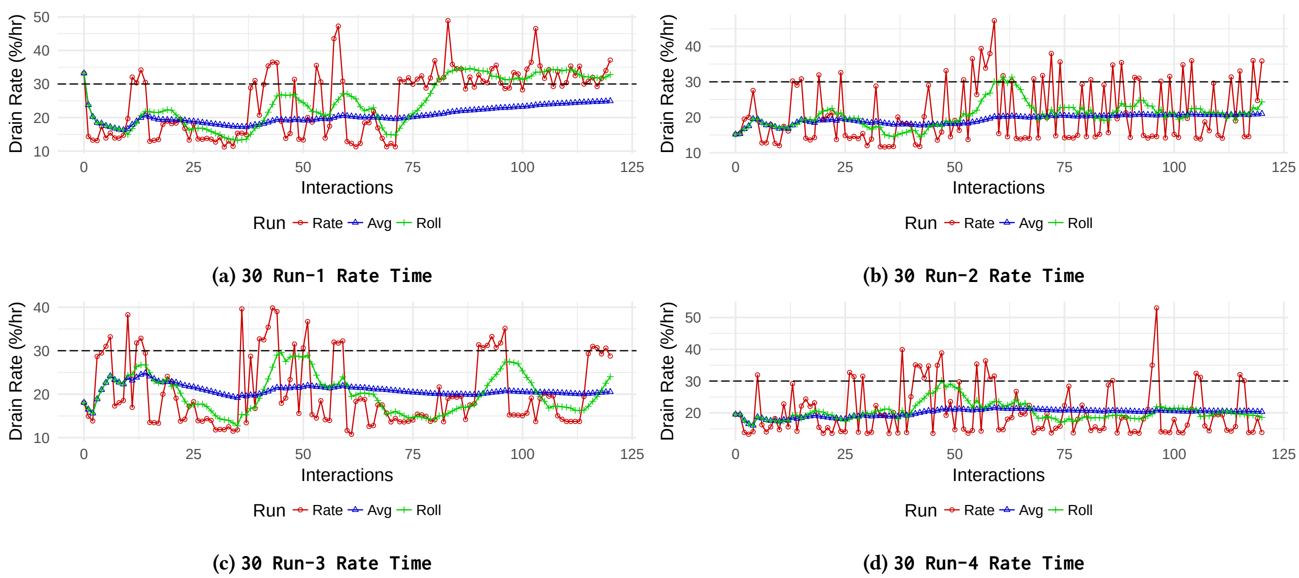

(a) `30 Run-1 Rate Time`

(b) `30 Run-2 Rate Time`

(c) `30 Run-3 Rate Time`

(d) `30 Run-4 Rate Time`

**Figure 8: Profile-2 Discrete Knob Driving Runs**




(a) `30 Run-1 Rate Time`

(b) `30 Run-2 Rate Time`

(c) `30 Run-3 Rate Time`

(d) `30 Run-4 Rate Time`

**Figure 9: Profile-3 Discrete Knob Driving Runs**