

Improving Program Repair Efficiency via Multi-armed Bandit

Supplementary Material

TABLE I

DISTRIBUTION OF HQ PATCHES OBSERVED IN CASINO; THE “OBS” AND “AVG” COLUMNS SHOW THE NUMBER OF VERSIONS FOR WHICH HQ PATCHES ARE OBSERVED AND THE AVERAGE NUMBER OF HQ PATCHES PER VERSION, RESPECTIVELY. IN THE LAST 5 COLUMNS, THE HIGHEST VALUES ARE HIGHLIGHTED.

Tool	Group	Size	Obs	Avg	Other	File	Method	Line	Template
TBAR	Positive	27	25	10.8	0.9	22.8	49.0	15.4	11.8
	Negative	21	9	18.8	52.6	9.6	34.4	1.8	1.7
AVATAR	Positive	9	8	10.4	3.0	0.0	78.6	15.4	3.0
	Negative	15	7	47.4	2.2	65.4	25.7	5.2	1.4
FIXMINER	Positive	9	8	4.0	0.0	1.4	29.8	16.6	52.2
	Negative	13	3	8.2	30.4	50.8	1.4	7.1	10.3
KPAR	Positive	6	5	6.4	23.5	15.7	37.0	15.7	8.0
	Negative	9	6	8.2	30.7	5.9	5.0	26.9	31.5
RECODER	Positive	13	12	38.9	0.6	55.2	24.9	19.2	N.A.
	Negative	26	17	12.1	65.9	5.3	13.1	15.7	N.A.
ALPHAREPAIR	Positive	14	13	48.0	18.3	35.9	37.8	8.0	N.A.
	Negative	11	6	60.7	0.0	0.0	81.8	18.2	N.A.

The last 5 columns of Table I show how close HQ patches are to the correct patches. The “Other” column shows the proportion of HQ patches that modify different files from the correct patch. The “File” column shows the proportion of HQ patches modifying the same file as the correct patch c while modifying a different method from c . The “Method” column shows the proportion of HQ patches modifying the same file and method as the correct patch c while modifying a different line from c . The remaining two columns are defined similarly.

As shown in the table, the HQ patches observed in the positive group tend to be closer to the correct patches than the HQ patches observed in the negative group. One exception is ALPHAREPAIR where CASINO finds about 10 times more plausible patches in one buggy version (closure-21) than the original tool (122 vs. 13), which causes more tests to be run in CASINO. The high ratios of method/line of the negative group of ALPHAREPAIR are due to those plausible patches modifying the same method/line as the correct patch of closure-21.