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A MIP model for scheduling India's General Elections and police movement

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Abstract

Conducting the General Elections for the 543 members of the Parliament of India across the 833 thousand polling stations spread over the 35 States TJO -1.318 TD.0001 Tc.388 Tw(with a)-5.4(minimum)-5

European Parliament elections with an electorate of 500 million and the US Congress elections with electorate of 312 million.

Elections in the past have been marked by instances of voter intimidation through violence or harassment in various forms, as well as clashes between political opponents(Scharff 2011). These incidences have been largely arrested through deployment of additional police forces during the polling process in order to bring pe

completed within the minimum possible time (ii) scheduling movement of police from the bases to the polling stations and polling stations of a certain stage to polling stations in the next stage, such that the requirement of police personnel at the polling stations are met, appropriate number of police personnel from each base are deployed and the total number of men-miles traversed by the police personnel are minimized.

Scheduling and sequencing of activities or jobs on scarce resources such as machines has been an active area of research for more than half a century. Over the years, there have been various applications of the theory of scheduling to diverse areas such as assignment of planes to airport gates, scheduling tasks to a computer CPU (Pinedo 2008), aircraft routing and scheduling (Guy Desaulniers 1997), flight crew scheduling (Glenn W. Graves 1993), scheduling of classes in schools and universities (John J. Dinkel 1989), scheduling sport

b : index for police bases

Notation for data elements:

S_r : set of constituencies of State r

R

(5)

Explanation of the objective function: The first term of the objective function is the number of men-miles travelled by police personnel leaving the police bases before election stages and entering the police bases after completion of election stages. The second term is the men-miles travelled by police personnel travelling between constituencies after completion of an election stage and before commencement of subsequent election stage. The third term penalizes instances of police personnel staying back in a constituency after completion of the election stage.

Explanation of the constraints: Constraint (1) ensures that elections for any constituency in any State are held in a particular stage. Constraint (2) ensures that elections for all constituencies in any State are held in the same stage. Constraint (3) ensures that the required number of police personnel is available at all polling stations of all constituencies in the States where elections are being conducted for a particular stage. Constraint (4) ensures that the total number of police personnel travelling to constituencies is less than or equal to the available number of police personnel at that particular base. Constraint (5) ensures that the number of police personnel of a particular police base entering a particular constituency

	Andhra Pradesh-Rajahmundry	20	31058			
3	Assam-Jorhat	14	18828	4	Bihar-Patna	40 57020
5	Goa-Dabolim Goa	2	1339	6	Gujarat-Rajkot	8 12912
					Gujarat-Vadodara	18 29656
7	Haryana-Hissar	10	12894	8	Himachal Pradesh-Kulu	4 7253
9	Jammu & Kashmir-Srinagar	6	9129	10	Karnataka-Hubli	28 46576
11	Kerala-Kozhikode	20	20510	12	Madhya Pradesh-Bhopal	29 47812
13	Maharashtra-Akola	14	25541	14	Manipur-Imphal	2 2193
	Maharashtra-Mumbai	34	57057			
15	Meghalaya-Shillong	2	2117	16	Mizoram-Aizawl	1 1028
17	Nagaland-Dimapur	1	1692	18	Orissa-Jeypore	21 31617
19	Punjab-Ludhiana	13	18846	20	Rajasthan-Jaipur	25 42699
21	Sikkim-Darjeeling	1	493	22	Tamil Nadu-Madurai	39 52158
23	Tripura-Agartala	2	3008	24	Uttar Pradesh-Agra	43 69654
					Uttar Pradesh-Gorakhpur	37 59792
25	West Bengal-Malda	42	66109	26	Chattisgarh-Raipur	11 20984

Movements	Airport (Number moved/ Total Number required)
Base to Stage 1 Meghalaya State	Shillong (11980/8468)
Base to Stage 1 Mizoram State	
Base to Stage 1 West Bengal State	
Stage 1 Meghalaya State to Stage 2 Nagaland State	Shillong to Dimapur(6768/6768)
Stage 1 Mizoram State to Stage 2 Manipur State	
Stage 1 West Bengal State to Stage 2 Arunachal Pradesh State	
Stage 1 West Bengal State to Stage 2 Manipur State	
Stage 1 West Bengal State to Stage 2 Sikkim State	
Stage 1 West Bengal State to Stage 2 Tripura State	
Stage 1 Meghalaya State to Stage 3 Assam State	Shillong to Jorhat (5212/75312)
Stage 1 West Bengal State to Stage 3 Assam State	
Stage 2 State to Stage 3 Assam State	

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