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Research Article

Multi - Event Sport Scheduling using Independent Domination

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Abstract

In this paper work, we wish to Schedule multi events in a sport with break and without break with the help of graph using independent domination.

Keywords: sports scheduling, independent Domination.

1. Introduction

Scheduling Sports events is a process which is arranging of different kinds of Sports in particular timing order for convenient of players and the organizers. Schedule sports events for their convenient of players to not to clash with other events and also for the convenient of event organizers to make the event conduct in short time that is without break. In another case, one player cannot play another game immediately, the player need rest. This same will happen to another player also. Likewise verity of sports may be play by many players. For their convenient, sports events should be arranged in a particular order in common are conduct at different time with break. In this paper, we schedule the multi sports for players convenient that is player can play more than one sports with break and without break with the help of graph theory using independent domination.

2. Definition

A Set S of vertices in a graph G is a **dominating set** if every vertex in V – S is adjacent to some vertices in S. A dominating set S is an **independent dominating set** if no two vertices in S are adjacent. **Iterated domination** is a greedy algorithm which finds a minimal dominating set, say S_1. Remove S_1 from G, and once again find a minimal dominating set S_2 in the graph $G – S_1$. Remove S_2 and once again find a minimal dominating set in the graph $G - S_1 - S_2$. Repeat this process until no vertices remain. One can also iteratively remove independents sets of vertices.

3. Scheduling sports without break using iterated independent domination

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This iterated method help to schedule sports events for their convenient of players to not to clash with other events and for their convenient of event organizer to make the event conduct in short time that is without break.

The greedy algorithm to find the schedule is, first Construct a simple graph G, where vertices are events and there is an edge between vertices if a player or more players participating in both the events (end vertices). Find a minimal independent dominating set S_1 in graph G. Consider the minimal independent domination set S_1 as period 1. Remove S_1 from G, and once again find a minimal independent dominating set S_2 in the graph $G - S_1$. Consider the minimal independent domination set S_2 as period 2. Remove S_2 from $G - S_1$, and once again find a minimal independent dominating set S_3 in the graph $G - S_1 - S_2$. Repeat this process until no vertices remain.

4.1 Example:

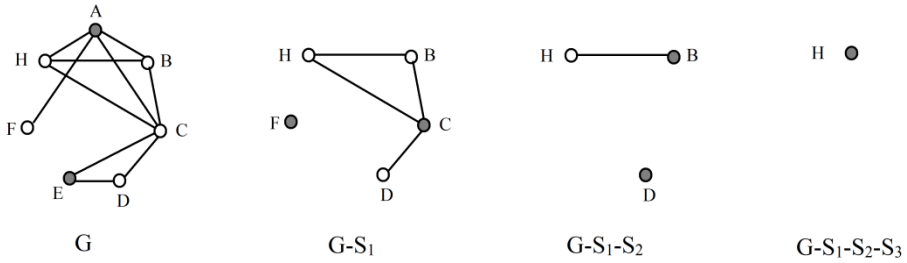
Find the Schedule of seven events where events are A, B, C, D, E, F and H without breaks, players who have participated more than one event is shown below;

Players	Events
p1	A,B,C
p2	B,H
p3	A,F
p4	C,D,E
p5	A,C,H

Table 1: players and their participating events

4.2 Schedule by iterated independent domination:

Construct a graph G, whose vertices are sports events and there is an edge between two vertices if a player or some players participated in both the sports events.



Here We Find minimal independent dominating set **S_1 = {A,E}** in graph G. Consider the minimal independent domination set S_1 as period 1. Remove S_1 from G, and once again find an minimal Independent dominating set **S_2 = {C,F}** in the graph $G - S_1$. Consider the minimal independent domination set S_2 as period 2. Remove S_2 from $G - S_1$, and once again find an minimal Independent dominating set **S_3 = {B,D}** in the graph $G - S_1 - S_2$. Consider the minimal independent domination set S_3 as period 3. Remove S_3 from $G - S_1 - S_2$, and once again find an minimal Independent dominating set **S_4 = {H}** in the graph $G - S_1 - S_2 - S_3$. Consider the minimal

independent domination set S_4 as period 4.Remove S_4 from $G - S_1 - S_2 - S_3$. There is no vertex remain so the process is stopped. All periods are arranged as shown below:

PERIOD	EVENTS
1	A,E
2	C,F
3	B,D
4	H

Table 2: schedule: periods and their events

Here, events in periods can organize in same time, which not affects the player participation in their respective events.

Players	**Period 1**		**Period 2**		**Period 3**		**Period 4**
	A	**E**	**C**	**F**	**B**	**D**	**H**
P1	**Game**		**Game**		**Game**		
P2					**Game**		**Game**
P3	**Game**			**Game**			
P4		**Game**	**Game**			**Game**	
P5	**Game**		**Game**				**Game**

Table 3: Players are participation in events without break and without clash with other events.

Here game represent the player participate in that event. In this table we can find that all player played all participated events without any clash

5.1 Scheduling multi sports with break using independent domination

One player cannot play another game immediately, the player need rest. This same will happen to another player also. Likewise verity of sports may be play by many players. For their convenient, sports events should be arranged in a particular order in common are conduct at different time with break. This method help to schedule sports events for their convenient of players with break. Here we construct a greedy algorithm to find the schedule with break.

5.1 Construction of a graph:

Construct a simple graph G, where vertices are events and there is an edge between vertices if a player or more players participating in both the events (end vertices).

If there is no vertex adjacent to all vertices in the graph G then go to greedy algorithm. If there is a vertex adjacent to all the vertices in the graph or some vertices adjacent to all other vertices in the graph then remove the vertex or vertices from the graph. Consider the resultant graph as a new graph G and consider the vertex or vertices as reserved events and then go to greedy algorithm.

5.2 Greedy algorithm:

- Find a minimum independent dominating set, say S_1.
- Find the minimum degree vertex in the set S_1, Say I_1. If there is more than one minimum degree vertex then choose any one vertex. If there is no vertex then there is a break before next event.
- Consider S_1- I_1 as T_1.
- Remove T_1 from graph G, and once again find a minimum independent dominating set S_2 in the graph G – T_1, Where I_1 is the initial independent dominating vertex in S_2.
- Find the min degree vertex in the set S_2 except I_1, Say I_2. If there is more than one minimum degree vertex then choose any one vertex. If there is no vertex then there is a break before next event.
- Consider S_2- I_2 as T_2.
- Remove T_2 from graph G –T_1 and once again find a minimum independent dominating set S_3 in the graph G - T_1- T_2, Where I_2 is the initial independent dominating vertex in S_3.
- Repeat this process until no vertices remain.

5.3 Arrangement of events:

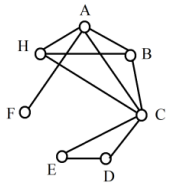
The events are scheduled by arranging the sets in this order T_1, T_2…T_N. In every T_k first event must be I_{k-1} where k = 2,…n. And if there are reserved events then it can be placed first or last in the order. Every reserved event must have a break before next event.

6. Example

Find the Schedule of seven events where events are A, B, C, D, E, F and H with breaks, players who have participated more than one event is as shown as in table 1.

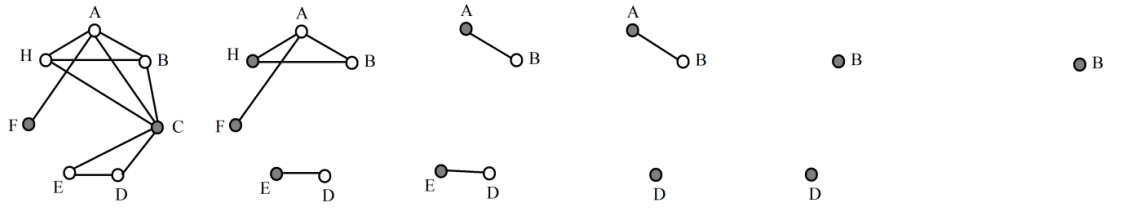
6.1 Construction of graph:

Construct a simple graph G, where vertices are events and there is an edge between vertices if a player or more players participating in both the events (end vertices). There is no vertex which is adjacent to all so there is no reserved event.



G

6.2 By using algorithm



G $\quad$ G-T_1 $\quad$ G-T_1-T_2 $\quad$ G-T_1-T_2-T_3 $\quad$ G-T_1-T_2-T_3-T_4 $\quad$ G-T_1-T_2-T_3-T_4-T_5

First we find a minimum independent dominating set in the graph G, say S_1= {C, F}.

Now we find the minimum degree vertex in the set S_1, Say **I_1= {F}.** Consider S_1- I_1 as **T_1={C}.** Remove T_1 from graph G, and once again find a minimum independent dominating set S_2= {F, H, E} in the graph G – T_1, Where I_1 is the initial independent dominating vertex in S_2.

Now, Find the minimum degree vertex in the set S_2 except I_1, Say **I_2 = {E}**. Consider S_2- I_2 as **T_2={F, H}.** Remove T_2 from graph G –T_1 and once again we find a minimum independent dominating set S_3={E,A} in the graph G - T_1- T_2, Where I_2 is the initial independent dominating vertex in S_3.

Now, Find the minimum degree vertex in the set S_3 except I_2, Say **I_3 = {A}.** Consider S_3- I_3 as **T_3={E}.** Remove T_3 from graph G –T_1–T_2 and once again we find a minimum independent dominating set S_4={A,D} in the graph G - T_1- T_2- T_3, Where I_3 is the initial independent dominating vertex in S_4.

Now, Find the minimum degree vertex in the set S_4 except I_3, Say **I_4 = {D}**. Consider S_4- I_4 as **T_4= {A}.** Remove T_4 from graph G - T_1- T_2- T_3 and once again we find a minimum independent dominating set S_5={B, D} in the graph G - T_1- T_2- T_3 - T_4, Where I_4 is the initial independent dominating vertex in S_5.

Now, Find the minimum degree vertex in the set S_5 except I_4, Say **I_5 = {B}**. Consider S_5- I_5 as **T_5= {D}.** Remove T_5 from graph G - T_1- T_2- T_3 - T_4 and once again we find a minimum independent dominating set S_6={B} in the graph G - T_1- T_2- T_3 - T_4 –T_5, Where I_5 is the initial independent dominating vertex in S_6.

Now, Find the minimum degree vertex in the set S_6 except I_4, Say **I_6 = {}**. Consider S_6- I_6 as **T_6= {B}.** Remove T_6 from graph G - T_1- T_2- T_3 - T_4- T_5. Now no vertex remains. So the process is stopped.

6.3 Arrangement of events:

The events are scheduled by arranging the sets in this order T_1, T_2…T_N. In every T_k first event must be I_{k-1} where k = 2,…n. Here F and H vertices are in the set T_2, among them I_1={F} should be the first event between them.

T Sets	Events Arranged
T_1={C}	C
T_2={F, H}.	F
	H
T_3={E}.	E
T_4= {A}.	A
T_5= {D}.	D
T_6= {B}.	B

Table 4: T sets vertices are arranged in events

Event C

Event F
Event H
Event E
Event A
Event D
Event B

Table 5: schedule of events with breaks

6.5 For every player their breaks

Player	**Event C**	**Event F**	**Event H**	**Event E**	**Event A**	**Event D**	**Event B**
P1	Game	Break	Break	Break	Game	Break	Game
P2	Break	Break	Game	Break	Break	Break	Game
P3	Break	Game	Break	Break	Game	Break	Break
P4	Game	Break	Break	Game	Break	Game	Break
P5	Game	Break	Game	Break	Game	Break	Break

Table 6: players are schedule with breaks

Here game represent the player participate in that event. In this table we can find that all players played all participated events with breaks.

7. Conclusion

Scheduling multi sports for the players convenient that is player can play more than one sports with break and without break with the help of graph theory using independent domination. This method also used for exam schedule, class schedule, etc for their convenient of participant with or without break. This method is one of the easy methods to find the solution.

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