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NBC Olympics

Code	**adi-vid-01028**
Title	NBC Olympics
Subtitle	What can a computer do for athletes?
Description	The United States Olympic Committee is announcing that it is going to use a computer...
Subject	Olympics;Performance Analysis
Duration	00:11:15
URL	https://arielweb.com/videos/play/adi-vid-01028
Date	2013-01-16 15:40:38
Label	Approved
Privacy	Public

U.S. Olympic Committee to Use Computer for Performance Improvement

The United States Olympic Committee announces its plan to use a computer system developed by Data General and sports scientist Dr. Gideon Ariel to enhance the performance of American Olympic athletes. The system, based on principles of gravity and motion, uses high-speed film and a digitizer to analyze athletes' movements and calculate forces acting upon their bodies.

The data is then processed to provide information on displacement, velocities, and acceleration, which can be used to optimize performance. The system has already been used successfully by discus thrower Mack Wilkins, who won a gold medal in the 1976 Olympics.

Dr. Ariel also uses the system to analyze sports equipment, such as tennis rackets and shoes, to improve their design and efficiency. The system is also being used to develop exercise equipment and training devices for athletes and for physical therapy.

The computerized biomechanical analysis can also project the limits of human achievement in various athletic endeavors, providing insights into the future of sports performance.

Model Id: gpt-4-0613
Created on: 2023-09-19 00:24:17
Processing time: 00:00:15.3460000
Total tokens: 2374

Audio transcription

Frame	#	Time	Spoken text
	0.	**00:00:00**	*The United States Olympic Committee is announcing today that it's going to use a computer*
	1.	**00:00:06**	*contributed by a company called Data General to improve the performances of every American*
	2.	**00:00:11**	*Olympic contender.*
	3.	**00:00:13**	*With us this morning is Colonel Don Miller, he's Executive Director of the Olympic Committee,*
	4.	**00:00:17**	*and Dr. Gideon Ariel, he's a sports scientist, a former Israeli Olympic athlete who has developed*
	5.	**00:00:22**	*a system that we're about to show you.*
	6.	**00:00:24**	*Let's begin with you, Colonel Miller.*
	7.	**00:00:25**	*How much can a computer do for an athlete?*
	8.	**00:00:28**	*Pretty much, Tom, I think it's a tremendous benefit to assist our athletes in perfecting*

Frame	#	Time	Spoken text
	9.	00:00:35	*their skills technique.*
	10.	00:00:38	*Athletes in other parts of the world are already using the system to analyze what they're doing*
	11.	00:00:41	*right and what they're doing wrong, I gather.*
	12.	00:00:43	*Yes, such as the East Germans are using the system, however, they do not have the sophistication*
	13.	00:00:51	*in their computer systems that we have in ours.*
	14.	00:00:54	*They cannot manipulate the maximum data that we can, therefore we are very confident that*
	15.	00:01:01	*we will be much further ahead than the East Germans, some of the other countries using*
	16.	00:01:06	*the computer system in the very near future, if we are not already ahead of them.*
	17.	00:01:11	*Alright, Dr. Gideon Ariel is the man who developed the system, he's going to tell us*
	18.	00:01:14	*about it this morning.*
	19.	00:01:15	*First of all, you want to change the analysis from eyeball to hard scientific judgment I*
	20.	00:01:19	*gather.*
	21.	00:01:20	*That's why you went ahead and did this.*
	22.	00:01:21	*Well the human eye actually cannot see performance because what performance is all about is manipulation*
	23.	00:01:27	*of forces in the body and you cannot see forces, you can see movement.*
	24.	00:01:32	*The computer can give us the data to see forces and to be able to optimize performance.*
	25.	00:01:40	*Ariel believes that what the computer sees can help Americans win gold medals.*
	26.	00:01:44	*It measures things a coach could never measure, precise velocities and angles of movement*
	27.	00:01:49	*and stress points that affect an athlete's performance.*
	28.	00:01:53	*Discus Thrower Mack Wilkins won a gold medal in the 76 Olympics after Ariel's computer*
	29.	00:01:58	*showed he could channel more energy into his throw.*
	30.	00:02:03	*We don't try to create bionic outlets, what we try to do is optimize the human body and*
	31.	00:02:09	*we apply actually techniques that was devised in the 17th century by Newton.*
	32.	00:02:16	*Isaac Newton of course never coached volleyball or track but his principles of gravity and*
	33.	00:02:21	*motion are the foundations of Gideon Ariel's work.*
	34.	00:02:24	*Ariel is here in Colorado Springs to analyze the U.S. women's volleyball team.*
	35.	00:02:29	*A big backswing he and his computer conclude makes an inefficient spike.*
	36.	00:02:36	*Ariel is a member of the U.S. Olympic sports medicine committee.*
	37.	00:02:39	*It is all aimed at developing a system for U.S. Olympic athletes.*
	38.	00:02:44	*A system that Gideon Ariel believes can go a step beyond stop watchers and rulers into*
	39.	00:02:50	*new measurements of the science we have made of game.*
	40.	00:02:55	*Dr. Ariel, what is biomechanics?*
	41.	00:02:58	*Well, literally basically it's what the world say.*

Frame	#	Time	Spoken text
	42.	00:03:02	*Biomeans life, mechanics mean the science of motions, the science of stresses.*
	43.	00:03:09	*So what we try to do is actually we combining life with the physical laws that affect in*
	44.	00:03:16	*life and that's where the world come biomechanics, the science of motions as related to biological*
	45.	00:03:23	*system.*
	46.	00:03:25	*Whatever happened in athletics, how far the shot go, how far the discus go, how far the*
	47.	00:03:30	*high jumper go, it all depends on how much forces were produced to be able the object*
	48.	00:03:36	*to move and the object could be the human body or could be a shot, could be a javelin,*
	49.	00:03:41	*could be a discus, could be a hammer, could be a frisbee.*
	50.	00:03:44	*We cannot see the forces but we can calculate the forces.*
	51.	00:03:48	*When we're talking about biomechanics, we're talking about calculations of kinetic parameters*
	52.	00:03:54	*or the forces that are acting upon the body.*
	53.	00:03:58	*We utilizing a high-speed film using photography.*
	54.	00:04:05	*Now after we develop the film, we can utilize an instrument which is called a digitizer.*
	55.	00:04:11	*You actually see the picture projected on the digitizer.*
	56.	00:04:15	*What we are doing, we're using a sonic pen to trace the joint center of the outlet and*
	57.	00:04:22	*this joint center location is going right to the computer.*
	58.	00:04:26	*Now at the past people did it by hand, it took months and months to do one analysis.*
	59.	00:04:32	*For the computer does, it takes the X and Y coordinates from the digitizers and put*
	60.	00:04:38	*it into a memory.*
	61.	00:04:40	*After we did the digitizing process which takes sometime hour, hour and a half to trace about*
	62.	00:04:46	*hundred frames each frame separately, we can reconstruct the pictures on the screen or*
	63.	00:04:54	*the megatec graphic system.*
	64.	00:04:58	*The data is processed by the computer and it gives us the following thing, the displacement,*
	65.	00:05:03	*how much the joint center moves, from that we can derive the velocities or how fast or*
	66.	00:05:09	*the speed of the segment, from that we can derive the acceleration and acceleration is*
	67.	00:05:14	*very important because the second Newton law said that force equaled to mass times acceleration.*
	68.	00:05:26	*If we know the mass of the different body parts and if we know the acceleration from*
	69.	00:05:29	*this technique, we can calculate the forces and what make an outlet move is actually rely*
	70.	00:05:35	*on forces.*
	71.	00:05:36	*The pattern of the movement or the acceleration pattern in each sequence is critically understanding*
	72.	00:05:43	*of the proper movement.*
	73.	00:05:52	*So we interpret the results of the outlet, we might make some changes and then two weeks*
	74.	00:05:57	*later we re-test them again and see if you correct this technique.*
	75.	00:06:05	*This is the non-direct measurement.*
	76.	00:06:08	*The uniqueness in this technique is that it's non-invasive, we don't touch the outlet*
	77.	00:06:13	*while we're taking the film, that's why the outlet can perform in the Olympic games or*

Frame	#	Time	Spoken text
	78.	00:06:18	*in our court of sport research center and he even doesn't know when we're taking the*
	79.	00:06:22	*film and then we analyze it.*
	80.	00:06:35	*The direct method consists of a force measurement device that records the forces directly, it*
	81.	00:06:40	*gives us the three orthogonal forces, this is a direct measurement, it's very important*
	82.	00:06:45	*for example for runner, how much shock it transferring to his body, for example comparison*
	83.	00:06:51	*between shoes can reveal to us immediately the data if there is any difference in force*
	84.	00:06:56	*transmission to the body, also how can we construct better shoes, or how can we design*
	85.	00:07:01	*shoes for particular outlet so you can perform in the Olympic games better.*
	86.	00:07:07	*Dr. Ariel, how factual are the results of your calculations?*
	87.	00:07:12	*Well it's as factual as gravitational laws, it's like when somebody said that I left*
	88.	00:07:20	*the shot put and it fell down, very seldom am I here, somebody said I left the shot put*
	89.	00:07:25	*and fell up, it's a physical loss, it cannot fall up unless you are in the moon, so if*
	90.	00:07:32	*we're finding out that there is some kind of linkage here that translates momentum from*
	91.	00:07:37	*one segment to the other, it couldn't be, it will be any different, also I used to tell*
	92.	00:07:42	*the shot put the shot put the shot put the shot, what about the psychology, I said well*
	93.	00:07:45	*I don't know yet the shot put or the through the shot, the shot just left the hand and*
	94.	00:07:50	*then it concentrate and sunny zoom it went five feet farther, I never saw it, if it ever*
	95.	00:07:56	*happened it always happened, when it was still in contact with the fingers and when the forces*
	96.	00:08:01	*were transmitted through the dynamic link into the shot from the hand, all this concentration*
	97.	00:08:07	*all this shouting and all this jumping after the shot left the hand, this is just in person*
	98.	00:08:13	*on the audience, the shot is going to land where it's supposed to land.*
	99.	00:08:20	*Tennis pros have been consulting Ariel too to find out what really happens when a tennis*
	100.	00:08:24	*ball hits a racket, after testing every kind of tennis ball Ariel worked up a special ball*
	101.	00:08:31	*and now using special high-speed film taken at over ten thousand frames per second, he's*
	102.	00:08:36	*testing rackets to see how they can be improved, there too Sir Isaac Newton turns out to be*
	103.	00:08:41	*an ace, his forehand and backhand may not have been much, but his overhead smash is famous.*
	104.	00:08:52	*Sometimes we don't recognize a good idea until it hits us in the head, now sports equipment*
	105.	00:08:58	*manufacturers are hiring Ariel's firm to find out if there are better ways to design and*
	106.	00:09:01	*make things for athletes to wear and use, shoes for instance.*
	107.	00:09:06	*Using a force platform Ariel generates hundreds of thousands of bits of data, which the computer*
	108.	00:09:11	*records and remembers and can work with.*
	109.	00:09:16	*You take a big truck and a little Volkswagen car and you have different tires on the cars,*

Frame	#	Time	Spoken text
	110.	**00:09:22**	*well why?*
	111.	**00:09:23**	*Because the different forces, the shock absorption characteristics are different for a big truck*
	112.	**00:09:27**	*versus a small car, but you take a three hundred pound outlet, size 11 shoes and 150 pounds*
	113.	**00:09:33**	*outlet, size 11 shoes and they wear the same shoes, that doesn't make sense.*
	114.	**00:09:38**	*The reason is that nobody bothered to calculate what's going on in the shoe, the really the*
	115.	**00:09:43**	*shoe was not designed for the man.*
	116.	**00:09:45**	*Ariel is also developing exercise equipment, training devices for use by athletes or for*
	117.	**00:09:50**	*rehabilitation, physical therapy, computers will program the workload and store the information*
	118.	**00:09:56**	*for coaches and doctors.*
	119.	**00:09:58**	*You can make a ball or a bat or a racket or a shoe out of different materials, but the*
	120.	**00:10:03**	*materials you can't change are ones like bone and muscle.*
	121.	**00:10:07**	*At some point, under some amount of strain, bone will fracture, muscle will tear and because*
	122.	**00:10:12**	*those are known quantities, Ariel's computers have been able to project what the limits*
	123.	**00:10:16**	*are of human achievement, how fast a human being will ever be able to run, to jump, to*
	124.	**00:10:21**	*throw, all forms of athletic endeavor have limits, and Ariel says he now knows what*
	125.	**00:10:27**	*they are.*
	126.	**00:10:28**	*In some cases, as in Bob Beaman's broad jump in the 1968 Olympics, the limit has already*
	127.	**00:10:33**	*been reached or something very close to it.*
	128.	**00:10:36**	*In others, man and woman have a long way to go.*
	129.	**00:10:39**	*The shot put record is now just over 70 feet.*
	130.	**00:10:43**	*Ariel projects that man is capable of throwing a 16 pound ball close to a hundred feet.*
	131.	**00:10:49**	*If you can tell the future, surely computerized biomechanical analysis should be able to settle*
	132.	**00:10:53**	*some of the long-standing bar bets of all time.*
	133.	**00:10:56**	*Would Jesse Owens still be a champion in today's competition?*
	134.	**00:11:00**	*Ariel says he would, using today's shoes and on today's tracks.*
	135.	**00:11:04**	*Would Secretary at Beat Man of War?*
	136.	**00:11:06**	*Ariel says he can tell.*
	137.	**00:11:08**	*The theoretical possibilities are fascinating.*

Video filename: **adi-vid-01028-nbc-olympics-256kbps.mp4**