Conclusion

The preceding ten chapters summarized the ten projects that were nominated in 2011. The nominees are still active in BCI research, and have already produced some exciting follow-up work. In this concluding chapter, we announce the winner of the 2011 BCI Award, present some analyses of nominees and submissions, and preview the 2012 award.

The 2011 Winner

The nominations were difficult, since many of the 64 submissions were also excellent. The jury had an even more difficult task after choosing the nominees: selecting the winner of the 2011 BCI Award. In addition to the honor of being chosen, the award of $3000, and the statue, the winner was also publicly announced at the Graz BCI conference in September 2011.

The winning team was Moritz Grosse-Wentrup and Bernhard Schölkopf from the Max Planck Institute for Intelligent Systems in Germany (Fig. 1). Their project was titled "What are the neuro-physiological causes of performance variations in brain-computer interfacing?" The project addressed a very important point: making BCI systems more robust. Their project even utilized gamma activity in the EEG spectrum.

Directions and Trends Reflected in the Awards

One of the goals of the BCI Award is to help identify major directions in BCI Research. By analyzing the different characteristics of the projects that were nominated in 2011, we can learn more about which facets were most appealing to the jury. Table 1 summarizes the BCI Award 2011 nominees. The nominees are categorized according to the control signals that were utilized and application areas.

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Fig. 1 The winner of the 2011 BCI Award, along with the jury and presenters. From *left to right*: Michael Tangermann, Gernot Müller-Putz, Gert Pfurtscheller, Theresa Vaughan, Moritz Grosse-Wentrup (*fifth from left*, *holding the Award*), Christoph Guger, Brendan Allison, Jane Huggins, Cuntai Guan, Robert Leeb

Table 1 shows that 4 projects used invasive technology (ECoG - Electrocorticogram/Spikes) and 6 projects measured non-invasively. Two nominated projects used evoked potentials and three projects motor imagery (MI) as principle. The division into application areas shows that control applications are most prominent, followed by robot control, communication and speech reconstruction and finally by stroke rehabilitation.

The BCI Award is also meant to show trends, such as themes that become more or less popular across different years. To more broadly explore the different facets of BCI research, we conducted another analysis with all 64 projects submitted to the 2011 BCI Award, and compared the results to all 57 projects submitted to the 2010 BCI Award. Table 2 summarizes the results. Among other trends, the 2011 Award drew more submissions that described real-time BCIs, and also introduced many new properties.

Interesting is that only two projects worked on off-line algorithms which was much higher in the past and this shows also that BCIs became real devices. Most of the BCIs use motor imagery, P300 principles and just a few use steady-state visual evoked potentials (SSVEP) or auditory steady-state response (ASSR). More than 70 % of the submission are using the EEG because of its simplicity and high time resolution compared to just a few fMRI, ECoG and NIRS projects. The most common applications under the 64 submissions are control, stroke/neural plasticity

Table 1 Summary of the 2011 BCI Award nominees

Title	Control Signal					Application				
	ECoG	Spikes	N200/ P300	NIRS/ physio	MI	Robot	Stroke	Control	Communication	Speech
Exploring the cortical dynamics of learning by leveraging BCI paradigms	X							X		
An auditory output brain-computer interface for speech communication		X								X
Seven degree of freedom cortical control of a robotic arm		X				X				
Utilizing high gamma (HG) band power changes as control signal for non-invasive BCI					X			X		
User-appropriate and robust control strategies to enhance brain computer interface performance and usability					X			X		
What are the neuro-physiological causes of performance variations in brain-computer interfacing?					X				X	
Using the electrocorticographic speech network to control a brain-computer interface in humans	X									X
Towards communication in the completely locked-in state: neuroelectric semantic conditioning BCI			X						X	
An affective BCI using multiple ERP components associated to facial emotion processing			X			X				
What's your next move? Detecting movement intention for stroke rehabilitation				X			X			

Table 2 Properties of all of the projects submitted to the BCI Awards in 2010 and 2011

Property	Number	2011 (%) (N=64)	2010 (%) (N=57)	Property	Number	2011 (%) (N=64)	2010 (%) (N=57)
Real-time BCI	61	95.3	65.2	Stroke/Neural plasticity	8	12.5	7.0
Off-line algorithms	2	3.1	17.5	Spelling	8	12.5	19.3
P300	16	25	29.8	Wheelchair/Robot	4	6.2	7.0
SSVEP	8	12.5	8.9	Internet/VR	2	3.1	8.8
Motor imagery	19	29.7	40.4	Control	22	34.4	17.5
ASSR	1	1.6	-	Platform/Technology	6	9.4	12.3
EEG	45	70.3	75.4	Monitoring	1	1.6	-
fMRI	2	3.1	3.5	Speech	3	4.7	-
ECoG	3	4.7	3.5	Coma	2	3.1	-
NIRS	3	4.7	1.8	Authentification	1	1.6	-
Spikes	8	12.5	-	Mechanical ventilation	1	1.6	-
Other signals	1	1.6	-	Learning	2	3.1	-
Electrodes	1	1.6	-	Sensation	1	1.6	-

and spelling. But there are also many new applications like monitoring, speech, coma, authentification, mechanical ventilation, learning and sensation that did not exist 2010.

Conclusion and Future Directions

Overall, the BCI Awards have helped to encourage excellence in BCI research, identify key directions, and promote BCI research around the world. The ten projects summarized in this book represent some of the most promising accomplishments from the top research groups. However, the 2012 BCI Award, which is underway as of this writing, has so far been even more competitive than before. We editors plan a book summarizing the nominees, their follow-up work, and further analyses of major trends.

g.tec has already committed to host the fourth annual BCI Award in 2013. Researchers are encouraged to keep abreast of relevant announcements at bci-award.com, and consider submitting their research. Given the level of competition, extra time to develop the best submission is strongly recommended. We editors would like to conclude by thanking all the groups who submitted projects to the BCI Awards over the years, and the many other innovators in BCI research.